FEBRUARY, 1941 VOL. 30, No. 2

JAN 20 1941

INDUSTRIAL ARTS and VOCATIONAL EDUCATION

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Mid-Term Testing Number

How a quality file is born

THE making of files which are both high in lasting qualities and correct in designs for the various kinds of work, metals and other materials for which they are intended is an industrial *science*. Nicholson has been at it for 76 years; makes more than 3000 kinds, sizes and cuts of files; finds each a "subject" worthy of conscientious thought.

Nicholson file manufacture extends far beyond factory walls. In metallurgical laboratories — in steel mills — in industrial plants where thousands of files are in daily use — and in our own proving shops — the study of file steels, file designs and file performance goes on and on.

From such experience we learn what steel analyses produce the sharpest and toughest files; what shapes of teeth produce the best results under given circumstances; what new filing problems come up as human ingenuity invents new products, develops new methods of production, sets new paces in industrial progress.

The major manufacturing steps under which Nicholson and Black Diamond files are "born" are something like this:

• ***STEEL.*** Nicholson file steels are made to our own specifications. Tons and tons are used daily toward the millions and millions of files Nicholson manufactures yearly. The steel comes in lengths of various widths and thicknesses; and each batch received from the steel mills is examined and tested for quality and uniformity. The actual making of a file begins with the cutting of a bar of steel to the proper length for the size file contemplated (Fig. 1).

• ***FORGING.*** With powerful trip-hammers, expert forgers shape the bar of steel into what is known as a *blank* (Fig. 2). The first operation shapes the point and body; the second, the tang.

• ***ANNEALING.*** Into a furnace or oven goes the blank for annealing —a highly important process toward "conditioning" the steel. To assure uniform grain, and to make the steel strong and tough, the degree of heat and length of heating are kept under strict laboratory control.

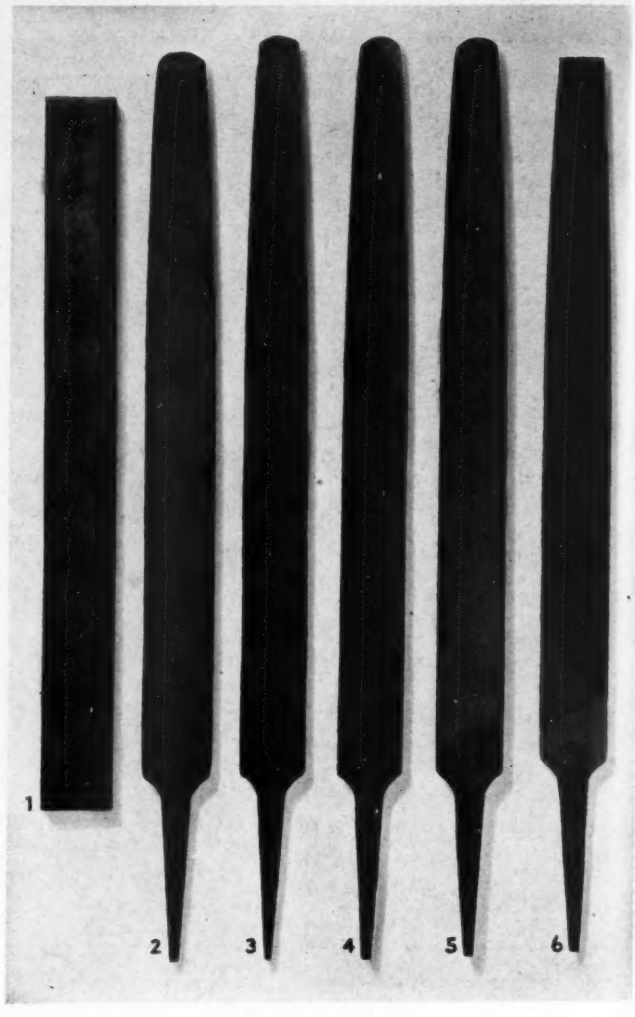
• ***SMOOTHING.*** Having been annealed, the blank is then straightened, ground to remove the scale, and draw-filed to assure uniform teeth and an even filing surface (Fig. 3).

• ***CUTTING.*** A machine operating a sharp, hard chisel—much as a sewing machine plies a needle—cuts and raises the first series of teeth known as the *overcut* (Fig. 4). The second or diagonal series of cuts produces the *upcut* (Fig. 5)—divides the *ridge*-like teeth of the first cut into a multiplicity of *pointed* teeth. This produces the double-cut type file usually known as a *flat* file. Files having only the single cut are commonly called *mill* files.

• ***HARDENING.*** Forged, annealed, ground, draw-filed and cut, the file is then branded and hardened. In this process the teeth are given a coating to prevent oxidation of the teeth points. The files are then brought to a carefully determined "cherry red" and dipped into a hardening bath in a manner that insures an exactly uniform degree of hardness throughout the filing area.

• ***FINISHING.*** File is then cleaned and sharpened to prepare the teeth for service. The tang is reheated, treated and blued to give it strength and toughness without brittleness. Finally the file is oiled to prevent rust. It is now ready for use (Fig. 6).

During each step of manufacture, Nicholson files are vigilantly watched and inspected. They are given a final test by trained inspectors. Each file must so accurately and uniformly



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NICHOLSON FILES

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FOR EVERY PURPOSE

INDUSTRIAL ARTS *and* VOCATIONAL EDUCATION

VOL. 30 FEBRUARY, 1941 No. 2

This Issue

As was announced last month, this issue presents a number of tests to its readers. These, it is hoped, will be helpful now that the end of the first semester is approaching. With these tests are two articles, the one by Martin J. Brennan, Jr., the other by John Edmund Crawford, which contain much information about available tests that can be used by teachers of industrial arts and vocational education.

Besides these two general articles on tests and testing, there is one test for the drafting room, two for the metalworking class, one for a girls' home-mechanics class, two for the print shop, and one for the woodworking class.

In addition to these tests, there is an assembly program by Donald M. Parkes which may be timely as the end of the semester approaches. It is in the form of a playlet which it is hoped will draw favorable attention to the industrial-arts classes. This playlet can easily be worked over, so that its application can fit other types of school shopwork.

There are other articles which should not be overlooked, both in the general articles section and in those reserved for the problems and projects division.

This Month's Cover

The photograph used for the cover this month shows a machine-shop student learning lathe work at the Kenosha Vocational and Adult School, Kenosha, Wis. The photograph was taken by an NYA student and was submitted by Edward W. Stluka of the NYA office, Milwaukee, Wis.

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Business ventures need to be properly equipped to produce a profit from operations. So do school shops. If a maximum return of student benefits is to be realized on the money invested for wood shop instruction, equipment must be of the finest quality. The Yates-American "J" Line is typical of what we mean by quality equipment . . . a correlated group of medium capacity machines designed to meet the requirements of the school field. The J-45 Oscillating Spindle Sander illustrated is a popular member of this line.

It is ruggedly built for continuous service. The base is a heavy one-piece casting which not only provides a strong foundation, but also serves to enclose the drive motor and the entire oscillating mechanism. The table is cast iron with a ground finish top surface. It may be tilted 45° to the left and 15° to the right, and may be adjusted vertically.

This machine has many uses in the school shop. In cabinet work and pattern making it saves hours of tedious hand labor on internal and irregular surfaces. Let us send complete information. Write now!

YATES-AMERICAN MACHINE COMPANY • BELOIT, WISCONSIN

Short Talks on Wood

SITKA SPRUCE (*Picea sitchensis*)

The largest of the spruces. Derives its name from the town of Sitka, Alaska. Often called "Tideland Spruce" because the exacting moisture requirements of the tree limit its inland distribution. The wood is light, soft, tough, straight-grained and easy to work.

Most of the cut is sold as lumber, yet it is used widely as a specialty wood and for boats, ladders, veneers, woodenware, boxes and barrels. One of the leading pulpwoods on the West Coast, and the most important lumber tree of Alaska.

Found in a restricted area along the Pacific coast from the Kodiak Islands in Alaska to Mendocino county, California. Prefers moist, sandy soils. Needs an abundant supply of moisture, but is tolerant of shade. Because of its thin bark is easily damaged by fire. Remarkable for its rapid growth and great size. Unsurpassed in beauty by any evergreen. Usually found in mixed stands with western hemlock, redwood, red cedar and maple.

May grow to a height of 200 feet with a trunk diameter up to 15 feet. Trunk is heavily buttressed at the base and is topped by a loose, open, pyramidal crown. In open stands holds its branches to the ground.

Bark is thin and is broken into loose, reddish-brown scales. Needles are flat, about one inch long, 4-angled and silvery above. Cones are abundant, pendulous, from 1 to 4 inches long, cylindrical and about 1½ inches in diameter.

To date, twenty-three brief articles similar to the one above and dealing with the more commonly used woods have appeared in these ads. As in the past, we continue to invite your suggestions as to the species of wood you would like featured in this series.

YATES-AMERICAN

INDUSTRIAL ARTS *and* VOCATIONAL EDUCATION

An Assembly Program— Why Industrial Arts

DONALD M. PARKES*

The following dramatization was presented for the commencement program in a junior high school. The school has a general shop which includes the following activities in its course of study: woodwork, electricity, sheet metal, mechanical drawing, molding, wrought iron, and art metal. The speaking parts may be readily changed and adapted to the activities of any shop desiring to present the program.

The boys derived both pleasure and knowledge from speaking through the microphone. A make-believe microphone made in the shop might be used, but in this case an actual amplifying system was used thus giving the boys additional knowledge and training.

The chart used to illustrate the working of the telephone was a diagrammatic sketch of the parts of the telephone made by the boy himself as part of his mechanical drawing.

In the mechanical-drawing discussion three lantern slides were used to depict the types of drawings shown herewith.

The stage was arranged to represent a general shop with benches and tools. The parents of the students who attended the program were impressed and interested because they were seeing the value of the industrial-arts program in modern education.

*Willow Grove, Pa.

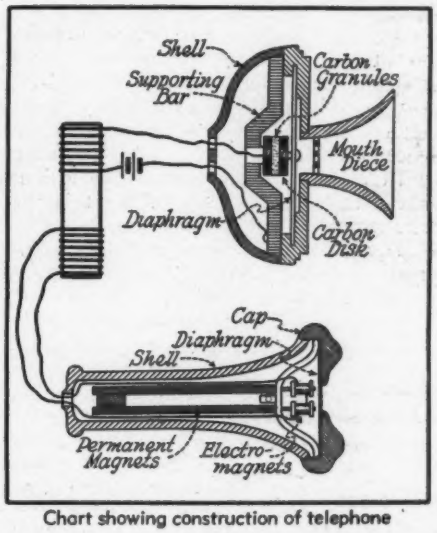


Chart showing construction of telephone

STAGE SETTING: General shop of a junior high school.

CHARACTERS: Announcer, Radio Interviewers, Electrician, Woodworker, Draftsman, Tinsmith, Wrought-iron Worker, Coppersmith, Shop Foreman.

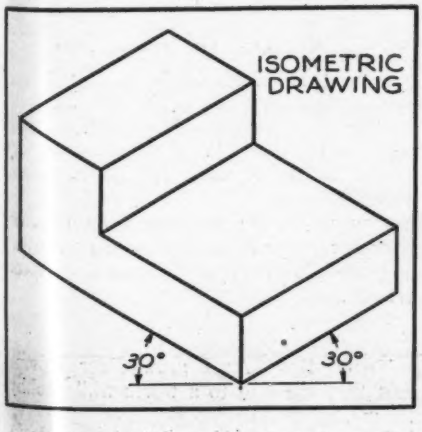
[*As the curtain rises the boys sing softly this parody of "Old Man River" from Show Boat*]:

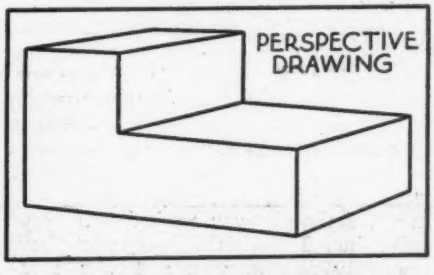
Keep on sawing,
Keep on pounding,
It's not alarming,
It's not astounding,
That we keep on pounding away,
We don't go grumbling
We don't go mumbling
And then our troubles are soon forgotten.
But while we're waiting we just keep on pounding away.

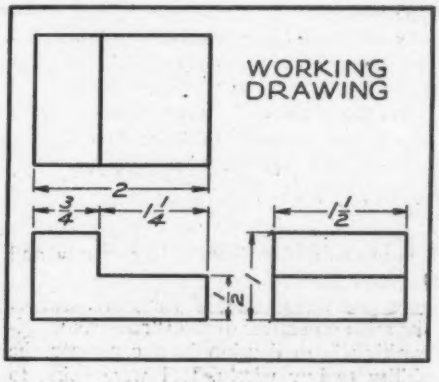
ANNOUNCER: Hello folks. This is station AJHS the voice of the Abington Junior High School.

At this time we invite you to visit with our two radio reporters as they interview the boys at work in the industrial-arts shop. We feel that you would be interested in learning the purposes of the industrial-arts program and its place in modern education. We now take you to the shop and the next voice you will hear will be that of our reporter, Jimmy Yost. Come in, Jim.

INTERVIEWER: Hello everyone. This is Jimmy Yost speaking. While Herbert Dean is rounding up some of these fellows I'll try to break through the noise and see







Lantern slides showing different types of drawings

what Malcolm Shoenberg is doing with so much wire [*turns to the electrician*] You seem to be greatly interested in what you are doing. Won't you tell us a little about your work?

ELECTRICIAN: This last semester some of the boys in the 8A classes have been interested in electricity, particularly in communication. Electricity is man's most widely used slave. It has made possible his advancement in transportation, communication, and chemical research.

INTERVIEWER: I understood you to say that you are particularly interested in communication. Just what do you mean by communication and what part has electricity played in its advancement?

ELECTRICIAN: Communication is the act of imparting or conveying messages. One phase of communication, for instance, is the sending and receiving of messages through the air by the radio. Electricity is the energy by which these messages are transmitted.

INTERVIEWER: Speaking of the telephone — I have often wondered just how it works. Can you show us how the voice is carried over a wire?

ELECTRICIAN [*Pointing to the chart*]: When a person speaks into the mouthpiece of the telephone the sound wave of his voice vibrates this metal diaphragm. The vibrating diaphragm causes tiny granules of carbon in this small box to be arranged in a certain order. There is a small current of electricity from a battery running through this box and as the diaphragm vibrates the carbon granules change the steady current to a fluctuating current. This fluctuating current travels through a transformer which increases its strength, and then it travels to the receiver of the receiving station. In the receiver there is a small electromagnet which is energized by this fluctuating current. The electromagnet acts upon another metal diaphragm causing it to vibrate in tune with the other diaphragm and send a sound wave which is picked up by the ear of the listener.

INTERVIEWER: I'll remember that the next time I talk over a telephone and I can appreciate the great value of electricity to modern life. I see Herb has found another boy with something interesting to talk about.

SECOND INTERVIEWER [*Speaking to the woodworker*]: You have a very fine piece of work here. I know you have been learning to use tools and machinery but of what value will this be to you later on?

WOODWORKER: I have had a great amount of pleasure in making this footstool. [*While the boy is talking the interviewer may be examining the footstool.*] I could probably buy one like it for several dollars, but while I was making it I learned to use various tools correctly and I have learned to appreciate the work that goes into the making of furniture. One of the main objectives of industrial-arts woodworking is to develop in a consumer the ability to buy wisely. If I were going to buy a piece of furniture I would want to be sure that it was well constructed, well designed, and finished properly. If I pay for a walnut table I want to be certain that I am getting a walnut table and not one made of a cheaper wood and finished to resemble walnut. It is difficult for most people to tell stained red gum from walnut if they are not familiar with the various kinds of wood. Red gum makes a very nice piece of furniture but it has a tendency to warp and twist out of shape while walnut will hold its shape for years.

SECOND INTERVIEWER: I never thought of woodworking in the school shop in that way before. I always thought the main purpose was to make something that mother would put in the attic or on the back porch.

INTERVIEWER [*Walks over to the boy at the drafting table*]: Here is something different from the other shopwork. It looks to me to be drawing. Are you making a drawing of a project?

DRAFTSMAN: No. This is part of the course in mechanical drawing. I expect to take up engineering in high school and college and I am specializing in drawing so that I will have learned the fundamentals by the time I get to high school. I will be able to progress more rapidly than I would if I had no previous experience in drawing.

INTERVIEWER: You seem to be looking ahead and planning wisely. What is this strange object you are drawing?

DRAFTSMAN: In mechanical drawing we make working drawings of objects. A working drawing consists of one or more separate views of an object, while a pictorial drawing will have one view showing the entire object. I have some slides here that will show you the difference between the various kinds of drawings [*at this point in the play the slides are shown with a small screen arranged on the platform*]. The first one is a perspective drawing showing the object in one view. It is used in sketching and in art but it is of little use to the mechanic because he cannot obtain his measurements from the drawing due to the foreshortened lines. The next slide shows an isometric drawing. This is a true drawing of an object viewed from an angle. All the straight lines are given in true lengths but it is hard to place the proper dimensions. The next slide shows a working drawing with the front, top, and side views in the proper positions. The necessary dimensions are given in the drawing. This type of a drawing makes it easy for the mechanic to see at a glance the size and shape of the object he is going to make. Nearly all of our drawings in the shop are working drawings and we learn early in the course to read them. All projects must be drawn first so that we have a drawing to follow.

SECOND INTERVIEWER: Jim, let's see what this group of boys are doing with metal. I thought you worked with wood only, but I find that you also have electricity and drawing and now I see that you are working with metal. [*He addresses one of the metalworkers.*] Won't you tell us something about your work?

FIRST BOY: In the Abington Junior High School our metalwork is divided into sheet metal, copper work, wrought iron, and molding. I am particularly interested in sheet-metal work. Here we learn to use the tools and material of the sheet-metal worker. While we do not do the large work of the sheet-metal worker, our projects are so selected that all practices used are carried out. A small project such as a sugar scoop and a dustpan requires a knowledge of drawing, bending, shaping, and soldering just the same as in the making of a rainspout or a cornice.

[*Turning to another boy.*] This boy is interested in wrought-iron work and has made some very useful projects for his home.

SECOND INTERVIEWER: Just what do you mean by wrought-iron work?

SECOND BOY: The art of wrought-iron working is very old. Many of our oldest buildings have samples of the high degree of craftsmanship performed by the colonial wrought-iron workers. The art disappeared for a time but has just lately become popular again. The wrought-iron worker must have an appreciation of what is good in design and a knowledge of the metal he is working with. Here in the shop we only do simple bending but we are learning the fundamentals of bending wrought iron. We pay particular attention to the design of a project because design in wrought iron is very important.

FIRST INTERVIEWER [*Turning to third boy*]: What were you just hammering on?

THIRD BOY: I am interested in copper work and I am making a copper candy dish.

FIRST INTERVIEWER: I have heard that working with copper has a long history. Can you tell us something of the great men who were coppersmiths?

THIRD BOY: Yes, coppersmithing was a great trade during the colonial times and many men made a living by making articles of copper and pewter. We have always thought of Paul Revere as riding on a horse but he was a very successful coppersmith.

INTERVIEWER: Why don't we hear of coppersmithing today?

THIRD BOY: The early coppersmiths took great pride in the fact that all their work was made by hand. To use a machine was a disgrace. Today, however, nearly all the little trays and ornaments are made by machines. We have many coppersmiths at work today but they cannot make these small articles to sell for the low price of the machine-made articles. However, there are many people who will pay the higher prices for the handmade articles.

INTERVIEWER: What do you hope to gain by this experience in copper work?

THIRD BOY: As I grow older I hope that this will lead to a worth-while hobby for me.

INTERVIEWER [*To shop foreman*]: I

know our radio audience has enjoyed listening to your descriptions of the shop activities but perhaps they wonder just what benefit you will get from the work. What is the purpose of the industrial-arts program and how does it fit into the educational program? Can you as shop foreman answer this question for us?

SHOP FOREMAN: It would take a great amount of time to explain the entire program of industrial arts but I will try to show just how it fits into the educational program. The educational program is based upon seven cardinal principles or objectives.

The objectives of industrial arts are practically the same and I shall discuss briefly a few of them. The first provides for a prevocational or tryout experience in a variety of mechanical activities. The general shop program as we have it in this school strives to meet this objective by offering a variety of activities. The second strives to develop leadership ability. The shop organization encourages this by having boy leaders in the class such as the shop foreman and the time clerk. The third objective is the developing of the ability to make worthy use of leisure time. We are encouraged to develop hobbies that will give us hours of pleasure.

The fourth tries to make wise consumers of our students. The shop activities are such that a student cannot fail to gain some appreciation of what is the best article to buy.

Another objective may be spoken of as good citizenship. We are always encouraged to help each other with our work. We try to make our shopwork as sociable as possible. We try to respect the property of others at all times.

I have mentioned only a few of the objectives of the industrial-arts program but when we consider that the educational program is made up of many different subjects we find that the objectives of any particular subject must necessarily correspond to the objectives of the entire program of education.

INTERVIEWER: I think our radio audience will agree with me that you have summed up the question very well and we thank you and your fellow workers for your cooperation in this broadcast.

[Boys hum the theme song softly while the Interviewers talk to the audience.] [Curtain closed.]

And now Ladies and Gentlemen as our theme song brings us to the end of our part of the program I turn the microphone over to our announcer, Herbert Dean.

ANNOUNCER: Radio Listeners, we have asked you to use your imagination in your visit into our make-believe shop and at this time we wish to invite you to visit our shop after the program, and see the boys of the 8A class working just as they do in every class period.

An Industrial-Arts Course for Girls

F. H. HARRIS*

In developing a practical industrial-arts course for girls, one central thought must be held in mind and every unit of work offered should grow directly out of it. The point around which the course of study crystallizes is very well expressed in the question, what should the girl know and be able to do in order to be a better homemaker?

The following units must be taken only as suggestions as to what girls should know and be able to do when making an evaluation which will, from an industrial-arts viewpoint, make the greatest contribution to the broader aims of a general education. It is designed to cover a year's work.

Samuel Frederick Hall writing in the "Industrial Education" Magazine for May, 1936, sets up the following aims for a course of study for girls:

1. To teach how to operate, care for, and maintain the electrical devices of the modern home.
2. To give information concerning the wise selection of industrial products.
3. To develop the ability to read blueprints and other drawings and an understanding of how a dwelling is designed and constructed with respect to practical and aesthetic values.
4. To provide opportunity for exploring abilities and aptitudes in craftwork.

Sylvan A. Yager outlines the following course of study for girls in industrial arts, which fits in very well with the aims stated before.

The first unit deals with mechanical and freehand drawing and sketching and may well extend over a four-week period. The fundamentals of orthographic projection are stressed with emphasis on their application. Freehand sketching and pencil and rule drawing, involving mechanical-drawing principles, are emphasized.

The second unit extends over a period of eight weeks and deals with a study of design, construction, care, and refinishing of furniture involving:

1. A brief study of the most popular periods of furniture with emphasis upon the characteristics of each period studied.
2. A brief study of a few of the most common pieces of furniture, such as the chair, table, bed, and dresser, to the extent that the girls will understand something about how they are made and what to look for in purchasing furniture. Frequent visits are made to furniture stores and furniture factories in connection with this part of the course.
3. A brief study of the different kinds of wood most frequently used in the manufacture of furniture with special emphasis upon the characteristics that make each one adaptable to furniture making.
4. A brief study of how to care for furniture with emphasis upon methods of cleaning, polishing, and simple repair, such as regluing parts of a chair.
5. A study of the refinishing of furniture involving actual practice in as wide a variety of work as time will permit. Usually each girl is required to refinish one or two pieces as laboratory shopwork and frequently she can refinish the furniture in her room.

The third unit is devoted to wood carving, wood turning, upholstering, ceramics, metalwork, etc., according to the special interest of the girls and should cover a period of six weeks. Each girl should be required to make one or more projects approved by the instructor.

The fourth unit extending over a period of six weeks is devoted largely to the care and repair of household mechanical appliances. In the modern home there will be found a considerable number of mechanical appliances and devices designed to lessen the drudgery of housework. This unit has for its purpose a study of the most common of these appliances so that the girls will understand better how to use them and how to care for them.

The fifth unit, extending over the remaining twelve weeks, is devoted to a study of the major problems connected with the planning and building of a house from the selection of a site to the all-important problem of financing.

The following list of problems, topics, and items will indicate in more detail the general nature of the work in this unit.

1. The factors involved in the selection of a building site.
2. Style and design as applied to houses.
3. A brief study of the geneology of the American home.
4. A brief study of types of houses.
5. Factors that determine the style of house to be built.
6. A study of a number of desirable plans for five- and six-room houses.
7. Present-day trends in house planning.
8. Class visits to a few selected and well-planned houses.
9. Class and individual visits to houses under construction.
10. Advantages and disadvantages of different kinds of building material.
11. A brief study of building codes and their purposes.
12. The value of insulation in building.
13. Critical study of heating systems.
14. Plumbing and plumbing fixtures.
15. Electrical circuits, outlets, and fixtures.

*Douglas High School, Wewoka, Okla.

16. Interior materials, finish, and hardware.
17. Built-in features.
18. Economy in planning and building.
19. Constants and variables in connection with home planning and building.
20. Methods of financing the building of a house.
21. A brief study of legal documents, such as deeds, abstracts, etc., in order that the girls may better understand their importance and meaning.
22. A brief study of specifications and their purpose.

Korn lists the following as some of the projects made by the girls:

Woodshop

Trays, toys, doorstops, candlesticks, picture frames, clockcases, benches, toolboxes, wall shelves, jewel chests, breadboards, mirror frames, medicine cabinets, hall trees, magazine racks, tables, smoking stands, sewing cabinets, footstools, hall benches, lamp shades, end tables, bookcases, upholstered stools, birdhouses, book ends, wastepaper baskets, turned lamps, model stages, nut bowls, caning chairs, bridge lamps, floor lamps, chairs, cedar chests, radio bench, telephone stand, and, taborets.

Metal and General Shop

Flower vases, metal birdhouses, door knockers, concrete flower boxes, sharpen knives, kitchen utensils, hot-dish mats, cans for "Lux," etc., letter holders, rings, bracelets, belts, sugar and cream set, cake and bread plates, stationery desk sets, simple wiring, wire electric bells, electric curling iron, garbage cans, dustpans, hot plates, toasters, boudoir lamps, sugar scoops, adjust gas burners, magazine racks, wash boilers, bridge lamps, ornamental vases, book ends, window ventilators, repair broken window, repair wire screens, license-tax holders, repair drop cord, flasher, metal furniture.

Conducting the Program

With the course of study carefully worked out, there yet faces the teacher the task of working out a very definite and purposeful attack or method of presenting the outlined program so that the desired objectives will be attained through the securing and maintenance of maximum pupil interest. In other words the program must be made dynamic with pupil interest and motivating force.

Lawrence F. Ashley has worked out a very unique and helpful experiment in the step-by-step, day-to-day routine of starting and carrying forward classwork. While his experiment was confined to the purposeful teaching of a class in beginning drawing it contains elements that can easily be applied to the broader field of all teaching. Using this as a basis, the method of conducting the program for a girl's class in industrial arts is determined.

Beginners Class in Mechanical and Freehand Drawing

I. *The First Day*
   a) Introductory remarks by instructor.
   b) Student lists name and interest.
   c) Grouping of student-interest areas.
II. *The Third Week*
   a) Review of the work covered thus far.
   b) Explanation of work by group leaders.
      1) Exchange of group ideas.
      2) Discussion of various interests.
   c) Instructor's explanation of the use of different instruments.
III. *The Fourth Week*
   a) Class observes the work of the other groups.
   b) Demonstration of orthographic projection.
   c) Instructor posts the rules for inking.
   d) Instructor checks learning units taught in mechanical drawing.
IV. *The Fifth Week*
   a) Conference with individual groups.
   b) Continuation of group interest.
   c) Instruction in lower-case letters.
V. *The Sixth Week*
   a) Instructor comments on the type of work they have been doing.
   b) Instructor explains the progress chart.
   c) Instructor teaches the class how to use various conventions and devices.
   d) Demonstration of the use of irregular curve and compasses.

As each unit of work is taken up, a detailed plan of presentation should be worked out just as the one shown in the foregoing.

Summary and Conclusions

There are valid reasons for extending the industrial-arts curriculum to include classes for girls, and very definite and worthy objectives have been set up for such classes.

From the studies made on this subject certain conclusions may be drawn.

1. Girls are receiving some industrial-arts training, but only a beginning has been made in this field.
2. Industrial arts for girls is becoming an important issue among industrial-arts teachers and supervisors.
3. Girls will become interested in industrial arts in proportion that the content of the course of study is designed to meet specific needs and interests.
4. From studies made, mixed classes were found to be general, because, no doubt, only a small number of girls chose to take the subject. This does not argue that the mixed class is necessarily the best.
5. Industrial-arts courses for girls should be elective in all grades, nine to twelve inclusive.
6. This is an unexplored field of education; the potentialities of which are yet unfathomed, inviting the careful study of schoolmen and challenging the industrial-arts teachers to meet the needs of our modern social and economic order.

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THE AMERICAN'S CREED

I believe in the United States of America as a government of the people, by the people, for the people; whose just powers are derived from the consent of the governed; a democracy in a republic, a sovereign nation of many sovereign states, a perfect union, one and inseparable, established upon those principles of freedom, equality, justice, and humanity for which American patriots sacrificed their lives and fortunes.

I therefore believe it is my duty to my country to love it, to support its constitution, to obey its laws, to respect its flag and to defend it against all enemies. — *William Tyler Page.*

SAFETY MENU

Even dietitians and cooks are boosting highway safety. Research conducted by Uncle Sam proves that persons living on a diet deficient in Vitamin A are subject to night blindness, or inability to see clearly in dim light.

So include leafy vegetables, egg yolks, milk and orange and tomato juice in your meals, as it may prevent you from becoming a traffic casualty. — *Milwaukee Safetygram.*

Vocational Guidance of the Underprivileged

HYMAN GOLDSTEIN*

"And whether life presents a bewildering array of opportunities or a baffling confusion of futilities, they must find an answer to the question that will not down: What shall I do?"[1]

If adequate guidance had been provided in the school, it is possible that the thousands of youths in our reformatories might not be in quite so unfortunate a plight. The school certainly offers a more satisfactory guidance organization and environment then the correctional institution.

Vocational guidance is admittedly a difficult matter. It is precarious and trying enough with those individuals who have relatively little in the way of problem behavior entering to complicate the picture. How much more so is it in the case of unstable and resentful individuals who are first exposed to the effects of guidance in the rather abnormal environment of the correctional institution. The term "abnormal" is used in the sense of atypical. The vocational guidance of delinquent boys will, it appears, always suffer from the not insignificant handicap of being administered behind prison bars and in an atmosphere that to many boys connotes a place to *do time*.

The group that ordinarily composes the population of a reformatory is generally studded with many cases of instability. Perhaps this very characteristic has contributed as much to their delinquency as other more obvious factors, such as economic urgency, delinquency areas, broken homes, and so forth. As a rule, we will find that the youngster who baffles and annoys his parents, teachers, and others with whom he comes into contact, and who, because of crimes committed mischievously or willfully, is finally committed to an institution, is a rather unstable person. It is generally found that he has failed to acquire any satisfactory and desirable fixed work habits. His knowledge of and experience with work has usually been gained in the rather handy and exciting, but socially less desirable, street-vending trades, such as newspaper hawking, bootblacking, and the like. These trades impose little responsibility upon him but leave a somewhat indelible mark on his future vocational preferences. Their very exciting and adventuresome nature overshadow in his mind in desirability any monotonous, unattractive occupation that the institution may offer, even though the offering does have the qualities of security, steadiness, and acceptability in the eyes of society. Where no or little vocational interests have hitherto been fostered or established, it is a difficult task to inculcate them, especially in the drab, somewhat colorless environment of institutional life. At times, it is a perplexing and monumental matter to direct purposes that have been aimless and will-o'-the-wisp like into more acceptable channels.

It is obvious that the social adjustment of the delinquent is the desideratum at which all correctional influences aim. And foremost among these influences is the inculcation of vocationally desirable purposes through adequate and psychologically sound guidance so well as the establishment of proper work habits through practical and pedagogically sound vocational education. Certainly, one factor that should help the boy to avoid delinquent habits on release is the possession of sufficient skill in some occupation that should assist in insuring that he will be self-supporting. But no less important is his attitude toward work and toward society.

In the institution the whole personality make-up of the youngster is studied in order to gain a more adequate knowledge of his assets and liabilities so that proper vocational placement may be made. In this examination the part contributed by the physician is not the least. It is reasonable to suppose that a thorough physical examination will help to discover any or all physical factors or handicaps that might make certain vocational shops inadvisable for the boy since he would be unable to hold such a position in industry. Of course, when the condition is remediable steps should be and are taken to ameliorate it. In similar fashion, the psychiatric examination helps to ascertain those particular cases whose mental condition is such that certain types of work might be preferable to others, perhaps on the basis of occupational therapy.

A comprehensive examination by the psychologist to determine the boy's intellectual endowments, native skills, educational achievement, and personality profile enables the preparation of a thoroughgoing report that yields an adequate picture of the boy's trade assets and liabilities and that will be of use to the committee that will consider his assignment to a suitable shop.

A study of the surveys of several delinquent populations reveals the fact that, as a group, delinquents appear to be slightly less intelligent than boys outside prison walls. This may be due to the fact that it is the dull criminal who is usually caught while his brighter colleagues manage to carve more successful careers out of the business of crime. As a group, delinquents appear also to be below average in school achievement and to be maladjusted in school placement. This maladjustment might often be responsible for truancy, misconduct, and school discontent, bringing with it the attempts to leave school at an early age in order to find greater satisfaction (and thrills) in crime. According to Ben D. Wood, "There is considerable evidence that either flunking students or successfully stuffing them with useless materials (the alleged 'disciplines') tends to make many pupils antisocial in attitude if not in deed, especially when their personal and social problems are neglected in the usual manner."[2] Another rather characteristic finding with respect to delinquents is the fact that they generally show immature emotional attitudes in the things they fear or worry about, in the things they consider wrong to do, in the things they like, and in the human qualities they admire. They often fail entirely to make the emotional transition from boyhood and its glorious emotional fancies to manhood and its rather drab and prosaic business of earning a livelihood.

Vocational guidance in an institution can be effective only when the entire cooperation of the boy is secured in following a program that is judged to be in his best interests. On admission, it is found in many cases that a defense mechanism and a defiant attitude create a protective shell into which the boy is likely to crawl at the slightest provocation. It is the task of the vocational counselor who works with the incoming boys to orient the boy to the institution, to attempt to soften this protective shell, and to gradually ease it out of the picture. In its place the counselor desires to build a respect for the institution and for what it stands. He wishes to instill confidence in the boy in the efforts that are being made in his behalf.

These boys have generally led unstable, disorganized lives before admission. They know little, if anything, about their capabilities or even their desires. The vocational counselor helps the boy to discover his likes and dislikes, his interests and ambitions, and to determine what

*Albany, N. Y.

[1] F. J. Keller, "What shall I do?" *Adult Educ.*, June, 1933.

[2] B. D. Wood, "Information for guidance," *Occupations*, June, 1935.

to do about them. In order to make the youngster more aware of his own abilities, aptitudes, and interests, a definite course in "self-discovery" is instituted. Books, pamphlets, posters, lectures, and conferences form the component parts of the course. Although information is given about many trades, the boy is encouraged to make a thorough study of the requirements, duties, and general features of two or three trades that he would prefer. No attempt is made to rush him in any way into making his choice since that would be adding pressure on an unstable individual in an environment that is far from optimum for guidance purposes. Guidance can never be successfully administered in a hurried fashion. The very meaning of the term denotes a leisurely weighing of values, courses, roads. Even though the incarceration of the delinquent is of relatively short duration, the guidance process must not be curtailed in any way if the main benefits of incarceration are to be secured. This matter of choosing a lifework is of as great importance for the delinquent as for the nondelinquent, if not greater. Too much time cannot be allotted to it.

The vocational information that the counselor imparts to the boy concerns itself with many aspects of the vocation. These aspects include knowledge of the nature of the work, the union affiliations that may be necessary, the salary limits (minimum and maximum) as well as the average pay in the industry, the opportunities for advancement and particularly a schematic picture of the advancement route, the question of supply of and demand for workers in the occupation, its dangers and hazards, the usual hours of employment, and the usual working conditions. In so far as the boy himself is concerned he is given information relative to the health and physical requirements of the trade, the educational and apprenticeship qualifications, the technical training required, and any other facts that may help him to get a clear, unbiased picture of the trade as a whole.

Within several weeks after admission the boy is usually taken on a tour of the vocational shops. This gives him a passing acquaintance with all the shops and, in addition, gives him an opportunity to see the vocational shop of his choice in action, something that seems more realistic than textbook descriptions or classroom discussions. A tour of the shops enables him to gain some idea of how self-supporting is the community in which he will shortly take his place as a cooperative worker.

In all of the vocational guidance the social aspect is continually stressed. The boy is made to view the occupation as a stepping stone to his rightful place as a useful, cooperative member of society. A prime consideration in the choice of a trade is the fact that the trade must be satisfactory not only to himself but to society and that it must furnish him with enough compensation to maintain himself (and possibly his dependents) upon release. This will help to obviate the necessity of and the desire for criminal activity.

It is recognized that the trade cannot be fully mastered in the time spent at the institution by the average inmate. However, it must also be recognized that enough skill can be acquired and sufficient vocational education can be taught during that time to enable the boy to qualify as an assistant or a helper when released. But more important is the value of the good work habits inculcated. It must be realized that, from the viewpoint of both the boy and society, what kind of a citizen he becomes far overshadows what shop units he finishes.

After a stay of several weeks in quarantine (during which time he has been available for examination and study by the physician, psychiatrist, psychologist, and others) the boy meets the committee which has collated its material (physical, psychiatric, psychological, social, religious, disciplinary, and educational) in order to place him in a shop best suited to his needs, desires, and abilities. In general, the philosophy underlying assignment is that of an applied hedonism. Assignment is normally made in accordance with the wishes of the boy, provided that these wishes are in harmony with the findings of the committee. In this respect, the boy is made to feel that he is not just a peg that is allocated arbitrarily to any convenient hole. He has his say, however slight or great that may be, in his assignment, and as a consequence, a better psychological adjustment is likely to result because a better psychological approach has been made. The fact is not overlooked that even good intelligence and a satisfactory physical constitution can both be counteracted by the strains and stresses of emotional maladjustment.

Throughout the period of vocational education, during which time he acquires the knowledge and skills of a particular occupation, the boy is under the watchful attention of the assigning committee. His vocational assignment may at any time be brought up for review or reconsideration in an effort to bring about a better adjustment. The social and psychiatric consequences of vocational maladjustment are too well recognized to question this procedure. The number of readjustments that may be necessary in any particular case will, of course, depend on the boy's stability, intelligence, and desire to make the most of his opportunities.

Vocational guidance in a correctional institution is bound up with the attempt to prepare the individual to return to live in a social order in which he had previously failed. The inculcation of habits, other than work habits, that are considered socially acceptable is part of the guidance and educational program. It is recognized that the underprivileged lad has usually been brought up in an environment where no great premium has been placed on good manners, self-control, neatness, or courtesy, to mention a few socially acceptable traits. Yet these are the very things that an employer looks for in his prospective employees. They make acquired technical skills more marketable, and help to insure advancement on the job.

While vocational guidance appears to have a definite function in correctional institutions, actually its functions are many and varied. It should be considered in and a part of the treatment program. It is a modified form of *vocational psychiatry* that aims to treat antisocial behavior by the process of eradicating the roots of vocational unadjustment and maladjustment.

In general, in institutions we are working with individuals who are retarded mentally, handicapped educationally, and immature emotionally. Vocational guidance, under these circumstances, must be a painstaking, at times discouraging, process. But it will be *worth the candle* if, in the end, failures in crime can be converted into plumbers or carpenters or auto mechanics, even though they may be rather mediocre as tradesmen.

What some institutions do attempt and what all should attempt is "to train every boy in such a way that he will know how to work well, and to give him the realization that in spite of keen competition the world holds a gainful place for him."[3] The question resolves itself into a matter of doing something *for* the youngster instead of trying merely to do the more conventional thing of doing something *with* him.

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[3]H. D. Williams, E. L. Angell, and R. R. Hannum, "Meeting the occupational needs of problem children," *Occupations*, Nov., 1934.

THINGS TO THINK ABOUT

R. W. Selvidge,

University of Missouri, Columbia, Mo.

We should never leave to chance the formation of exact habits.

There is no particular development in acquiring facts. The development comes in using them.

Pride in one's ability to do useful things is one of the best guarantees of good citizenship. In order to develop this attitude, we must require good workmanship. No one with right ideals with respect to standards can take pride in careless or slovenly work. It is a great mistake to suppose that in order to maintain interest we must permit and approve poor work and low standards of accomplishment. Nothing is more detrimental to permanent interest.

Teaching is the response to the desire to learn, and while one may desire to learn without being taught, we cannot teach one who does not desire to learn.

The teacher's difficulty does not lie in teaching a person what he is already interested in, and desires to learn, but in interesting him in the things he should learn.

Industrial-Arts Ground Course in Aviation

STANLEY S. ZAMORY*

Aviation has not so long ago emerged from its stage of infancy. Today in this field, progress is so great and so rapid that a great many of our engineers are finding it difficult to keep up with it. The field of aeronautics seems to be unlimited as to its future possibilities. Civil aviation is on the threshold of tremendous expansion and progress. Bearing this in mind, it seems that many more students must be educated to meet the demands of this great industry.

It is not enough to train youth in our colleges, in larger vocational schools, in private schools, and in government schools. Our secondary schools should do their share within their limitations. That is primarily why this course of study is presented. It is intended for the small school where there is a lack of funds and personnel for a vocational aviation program, and is designed to be an industrial-arts ground course in aviation.

Ground Course

Objectives: (1) Development of greater air mindedness. (2) Guidance in the field of aeronautics. (3) Study of fundamental aerodynamics. (4) Study of economic importance of aviation.

Time allotment: Five 50-min. periods per week. Twenty weeks.

Textbook: No basic text — several reference texts (see bibliography).

Outside Preparation: Reference reading assignments; visits to airports, airplane factories, etc.; notebooks; product folders; research work; air-route maps; aviation statistics; model building; essays.

Industrial Arts — Ground Course in Aviation

History of Aviation

1. *Early Balloons.*
   a) Joseph Jacques Montgolfier (1783).
   b) J. A. C. Charles (France).
   c) Jean De Rozier (France).
   d) Count Ferdinand Von Zeppelin (1897).
   e) Alberto Santos Cumont (1901).
2. *Glider Stage.*
   a) Lilienthal in Germany, Pilcher in England, Chanute in America, LeBris in France.
3. *First Motor-Driven Airplane Flight.*
   a) Orville and Wilbur Wright.
4. *Famous Flights and Fliers.*
   a) U. S. and Foreign.
   b) Chronological Order.

Fundamental Aerodynamics

1. *Forces Acting on an Airplane.*
   a) Lift.
   b) Thrust.
   c) Gravity.
   d) Drag.
2. *Wings.*
   a) Lift of a wing.
   b) Drag on wing.
   c) Streamlining.
   d) Chord, aspect ratio.
   e) Incidence angles.
   f) Types of wings — shape — section.
   g) Ailerons.
3. *Fuselage.*
   a) Types.
   b) Streamlining.
   c) Materials and construction.
4. *Elevators and rudders.*
   a) Shapes.
   b) Purpose.
   c) Control.
5. *Propellers.*
   a) Shapes.
   b) Number of blades.
   c) Pitch and pitch control.
   d) Materials.
   e) Present difficulties.

Types of Airplanes and Their Uses

1. Monoplane.
2. Biplane.
3. Triplane.
4. Seaplane.
5. Autogiro.
6. Helicopter.

Types of Airplane Motors

1. Radical — single and twin row.
2. In-line.
3. V type.
4. W type.
5. X type.

Airplane Instruments

1. Compass.
2. Altimeters.
3. Automatic pilot.
4. Fuel-pressure gauges.
5. Oil pressure and temperature.
6. Tachometer.
7. Gas analyzer.
8. Manifold-pressure gauges.
9. Turn-and-bank indicator.
10. Air-speed indicator.
11. Stabilizer indicator.
12. Propeller pitch control.
13. Rudder adjuster.
14. Air-temperature indicator.
15. Engine-head thermocouple indicators.
16. Fuel gauge.
17. Gas throttles.
18. Rate of climb indicator.
19. Aileron adjusters.
20. Carburetor temperature gauge.
21. Supercharger.

Air Navigation

1. Piloting by landmarks.
2. Dead reckoning.
3. Compass piloting.
4. Celestial piloting.
5. Radio piloting.

Meteorology in Aviation

1. Study of atmosphere.
2. Cloud structure.
3. U. S. Weather Bureau.
4. Weather maps.

U. S. Air Mail

1. History.
2. Transcontinental and transoceanic routes.
3. Value of air-mail service.

Air-line Service

1. History.
2. Routes.
3. Modern comforts of air travel.
4. Cost of air travel.
5. Air-line companies.

Airports and Their Management

1. Locations of airports.
2. Buildings.
3. Traffic regulations.
4. Airport lighting.
5. Radio and beam service.
6. Airport personnel.

Civil Air Regulations

1. Registration certificates.
2. Identification letters.
3. Title transfers.
4. Pilot licenses.
5. Accident investigations.
6. Penalties for violations.

Opportunities in Aviation

1. Pilots and pilot training.
2. Mechanics — specialization.
3. Radio operators.
4. Navigators.
5. Meteorologist.
6. Engineers and designers.
7. Airport personnel.
8. Stewards and stewardesses.
9. Executives.
10. Qualifications necessary for each.

Training for Aviation

1. Training schools and colleges.
2. Opportunities in U. S. Army and Navy.

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(Continued on page 50)

*High School, Sidney, N. Y.

INDUSTRIAL ARTS and VOCATIONAL EDUCATION

John J. Metz, Editor

WASHINGTON AND LINCOLN AND OUR TIMES

During the month of February, the birthdays of two outstanding American statesmen, Washington and Lincoln, will be celebrated by the schools. Both of these national heroes attained prominence because of their steadfastness in trying times, their honesty, and because their thoughts and their counsel were ever aimed at the greatest good of our country.

Today America again needs the guidance of unselfish, farsighted men. Pressure groups are at work, trying their best to gain adherence for one side or the other in the gigantic, immoral struggle for world power now going on in Europe.

One wonders where Washington and Lincoln would stand today. Would they urge, as so many do, that the youth of America be again sacrificed in a conflict started and fostered by men whose selfish interests are surely not for the good of their own country or countries, and most assuredly not for the good of our own beloved United States.

While both Washington and Lincoln are known to us mainly because of their outstanding abilities in the conduct of the affairs of our nation, nevertheless, they also are known to have done noteworthy deeds in other lines of pursuit. This, together with the many character qualities which both of these men possessed, makes them excellent models to be held up before the students in our school shops, even though special programs in their honor be held at general school functions. Under conditions such as are confronting our country today, we cannot do too much in calling attention to such sterling characters as Washington and Lincoln.

TESTING AND TESTS

As the first semester of the school year 1940–41 is approaching its end, the necessity of appraising what has been accomplished by the teacher and by the student again obtrudes.

There are still many teachers, especially among those teaching shop subjects, who frown upon the use of the newer type tests, and even decry the use of any type of examination intended to measure what has been accomplished.

It would seem that common sense would show that in schoolwork as in any other undertaking, some kind of measurement ought to be applied to a finished job to see whether it has come out according to specifications. When a house is built, numerous visits are made while it is under construction to ascertain whether it is being built according to the architect's plans and specifications. The same procedure is carried out in many other human transactions, and it seems to be quite logical and proper that some type of measuring device be applied to check up on the school product, our boys and girls, as they progress through the various levels of school life.

It does not matter so much whether this or that teacher wants to adhere to the old traditional type of examination. He may not be applying the very best kind of measuring stick, but he is at least trying to do something to evaluate what he has accomplished with those who were in his charge.

Then there are those who are not adverse to using the objective type of examination in their classes, but they have developed a strong dislike for certain tests which they describe as mere implements of guesswork. Such teachers should not hesitate to choose other kinds that are more to their liking. But all should develop some type of testing program, and they should do something about interpreting the test outcomes so that shop teaching on any level, no matter whether it be of the industrial-arts variety or of the vocational type, will gradually be developed to have a deeper and more significant meaning in the lives of our students.

SAFEGUARDING MENTAL HEALTH

In a recent editorial, a Milwaukee paper calls attention to the importance of doing something toward the prevention and cure of mental diseases and the training of the mentally handicapped.

That this problem is highly important is evidenced by the fact that at the time this editorial was written there were about 15,000 inmates in the Wisconsin state and county institutions for the insane and feeble minded.

The number of persons confined in penal and correctional institutions at the same time in Wisconsin was somewhat under 3000. Attention was called to the fact, that while the state makes some attempt at providing training facilities for the 3000, nothing was being done for the 15,000.

It is well known that the institutionalizing of crime requires an enormous amount of money each year in our country. While the care of the insane and mentally handicapped may be proportionately somewhat lower, nevertheless, if Wisconsin is a criterion of conditions in other states, then the larger number of those taken care of in the institutions for the insane and feeble minded would represent an expenditure two to three times that required for the care of the criminals.

Those actively engaged in teaching either industrial arts or vocational education, know the far-reaching influence which their practical subjects may have on people who have unstable personalities and need the influence of some tangible, personally appealing, activity which keeps mind and body occupied sufficiently to prevent nervous, emotional reactions, sleeplessness, and the many other forms of mental disorders which now fill our institutions.

It is well known that the delinquency rate among children of school-going age is lower in cities where the educational systems provide good industrial-arts and vocational-education programs. The old adage that an ounce of prevention is worth a pound of cure, seems to be still operating. One would, therefore, expect that the public would gladly furnish more and better opportunities so that the schools might offer more efficient practical shop courses which have proved so beneficial in so many ways. It seems, however, that we are a penny-wise and pound-foolish nation. It is so easy, in times of stress, to cut down school budgets by reducing or eliminating the school shop, thereby weakening or taking away one of the most stabilizing influences which the school can exert in the lives of its students.

The therapeutic values of industrial arts and vocational education should by all means be tried out in the institutions of the mentally handicapped. In the meantime, however, we should not overlook the need of providing more and better school-shop facilities to help everybody acquire habits, and thought and activity patterns, which will safeguard the mental health of the individual.

Seeing Through Shadows

DEAN M. SCHWEICKHARD*

Legendary Influence

It is ordinarily supposed that with the advance of education and intellectual enlightenment there is a corresponding decline in unstable and superstitious beliefs. The terror attached to such things may become almost negligible in the light of civilization, but their continued observance is not always entirely eliminated.

If all superstitions and legendary beliefs were entirely unfounded they could be completely eradicated in the presence of reason. Many of them, however, are based upon vague traces of truth which have been discovered in the course of human experience, but which have been incorrectly interpreted or applied.

The month of February brings with it the old tradition of the ground hog, whose behavior on the second day of the month is taken as an indication of the weather for the subsequent six weeks. If he sees his shadow on that day it is said he goes back into his winter hiding place to stay until the middle of March when he can come out with the expectation of finding spring on its way.

Some think it strange that the story should be thus constructed, for if there are shadows visible on that day the sun must, of course, be shining — and what could be more favorable than a sunshiny day in winter? It might seem more reasonable to suppose that a dismal gray sky, shutting out the sun and casting a shadow over the entire landscape, would be looked upon as a more certain sign of continued winter weather.

As a matter of fact the tradition of the ground hog and his shadow probably has little or no meteorological significance, but rather has its origin in the realm of human experience, where the variations in light and shadow have tremendous effects. Those variations are not confined to the field of optical visibility, but include likewise the moods, passions, ambitions, aspirations, and accomplishments of man. The shadows which can be seen are more readily detected and serve as a foundation from which to see through some of the shadows more difficult to understand.

Transitory Reactions

To some minds an actual or symbolic shadow is always looked upon as a cause for gloom, but in everyday experience this is far from the truth. When a cloud passes over the face of the sun a temporary shadow is produced, and the reactions of those upon whom it falls depend upon the situations in which they happen to find themselves at the time. If the day has been chilly and generally discouraging the shadow of the cloud makes the outlook still more dismal. Those who have planned a joyous outing are likely to complain at the possibility of rain, even though the earth may need it. He who is traveling by automobile may be apprehensive lest the cloud be a forerunner of an impending storm.

Or the day may have been hot from the incessant beating of a merciless sun. To the person toiling and suffering in the heat of such a day the cloud comes as a relief. It is soothing, restful, and cooling in the midst of conditions otherwise unbearable. Those who seek the glare of eternal sunlight would profit by such an experience. They need to realize that day after day of uninterrupted sunshine makes a desert.

In recent years it appeared that a new desert was coming into existence on the western plains of the United States. There were no clouds nor trees, nor even grass to shade the earth. The people were without shadows so long they began looking desperately for them. Finally clouds appeared, but they were clouds of dust which brought not relief but further misery. Those were shadows indeed and the area affected came to be known as the dust bowl.

Centuries ago an eclipse of the sun was an event of great concern, for it cast a deep shadow upon the earth, the meaning of which was beyond the limits of human comprehension. Today it is looked upon as a scientific phenomenon, the exact beginning and ending of which are within man's power to calculate.

As man has come to know more about the shadows of life that can be seen or felt, he has learned that whenever there is a shadow there is also a source of light. He learned long ago that only through the great shadow of night was he enabled to behold the glory of the stars and study their paths through the heavens. Even the small boy carrying the lantern in the dark discovered that shadows can do nothing of themselves. They move only as the light or the object which makes them moves, and they grow or shrink in size as the distance between the light and the object changes.

Ominous Aspects

Even though much has been learned about shadows through ancestry, childhood, and scientific discovery, still that knowledge is sometimes forgotten temporarily in the midst of life's perplexities. Some people are always in a shadow because they see only the dismal side of each situation while they are in it, and spend their time grieving afterward because they missed the joy they might have had. The shadow of discouragement has a serious enervating effect; despair makes all the world look black; the gloom of poverty generates thoughts of envy, hatred, and desperation; doubt and uncertainty becloud the vision; and the shadow of distrust injects the elements of dissolution into lifelong friendships.

The shadow in human experience which perhaps is hardest to see through is that of prejudice. It shows itself in fields of religion, politics, racial relations, class distinction, and personal contacts. To it may be charged mob violence, unfair treatment of children at home or at school, industrial disagreements, and thousands of instances where judgment goes awry.

In many school circles prejudice persisted long in academic minds against work of a manipulative nature. The counseling function, which has been evolved for the purpose of helping students choose the way ahead impartially, has sometimes been tinged with prejudice against the most serviceable way of life. The chief characteristic of prejudice is the conclusion drawn hastily or without due consideration for all the factors involved.

Utilization of Shadows

Industry and science have made very practical use of the shadow. Before clocks or watches were invented, the slowly moving shadow of a stationary object in the sunlight was utilized in the sundial, as a means of telling time. The whole field of photography and the limitless ramifications of light and dark illustration are based upon the simple principle of the shadow. Without the interruptions and variations in light we would not have the moving picture, nor the lighting effects conducive to rest and relaxation in the home.

When shadows come, as come they will, it is not for us to put on the mantle of mourning and give way to despair, but set about to either get out of the shadow, eradicate it by removing its cause, or put it to work. When the western dust bowl developed, scientists set about delving deep into the subsoil to replace the subterranean moisture and thus permit the recurrence of the forces which would reproduce, if possible, the natural shadows in their normal cycle.

Serious-thinking people today are sensing the approach of many shadows and the deepening of some which have already appeared. Some seek to deny their existence, others try to laugh them off, and there are still others who believe we must go into deeper shadows of hardship and suffering before we can emerge into the light of

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happy living. Reflection reveals that the most valuable and lasting accomplishments of the race have come from deep realization of dire needs.

A farseeing minister speaking on a national radio program not long ago prayed: "Lord keep us from the bitterness of adversity and gloom that follows defeat." Through that appeal there breaks forth the light by which we may see that the shadow of national crisis, strife, need, suffering, or sorrow alone is not the force by which we may hope for rejuvenation, but rather the deeper resources which these experiences call forth.

Industrial Arts Ground Course in Aviation

(Continued from page 47)

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Chief of the Air Corp., War Department, Washington, D. C.; Navy Department, Washington, D. C.

Pan American Airways, 135 E. 42nd St., New York, N. Y.

Properties, Selection, and Suitability of Woods for Woodworking

DONALD G. COLEMAN*

(Continued from January, 1941, Industrial Arts and Vocational Education)

Splitting in Nailing (Hardwoods)

The splitting of wood by nails greatly reduces their holding power. Even if the wood is split only slightly around the nail

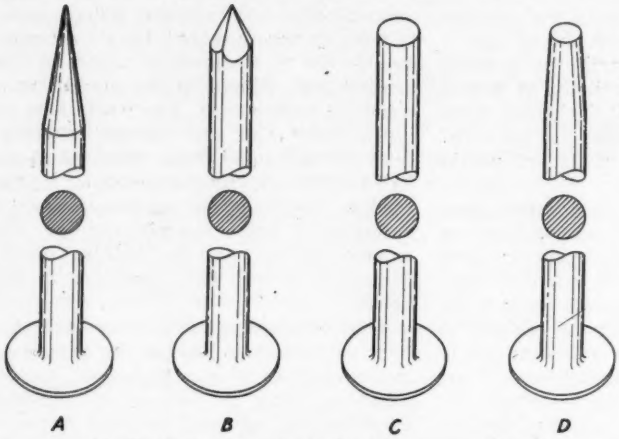

Fig. 11. Types of nail points: A, long; B, common; C, blunt; D, blunt tapered

there is considerable loss in holding power. Because of hardness and texture characteristics some woods split more in nailing than do others. The heavy, dense woods, such as maple, oak, and hickory, split more in nailing than do the lightweight woods, such as basswood, spruce, and true firs. The nonuniform-textured woods, like southern yellow pine and Douglas fir, split more than do the uniform-textured woods like northern white pine, sugar pine, or ponderosa pine. The most common means taken to reduce splitting is the use of smaller nails. The number of small nails must be increased, of course, to maintain the same gross holding power. Blunt-pointed nails are now available on the market, and sharp-pointed nails can be blunted, a handful at a time, on a grindstone or emery wheel. Blunt-pointed nails have a smaller tendency to split wood than do sharp-pointed nails. Too much blunting, however, results in a loss of holding power.

The old-fashioned cut nail with its blunt point has less tendency to split than does the modern pointed nail. Cut nails, however, do not have the holding power of the modern pointed nail.

The foregoing classification of the splitting tendencies of 23 important hardwoods is based upon the percentage of complete splits in driving 7d box nails into air-dry boards three eighths of an inch thick, the nails being driven within one half in. of the ends of the boards.

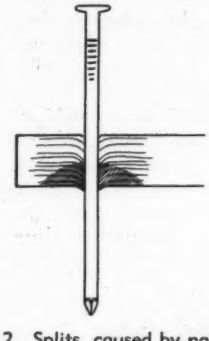

Fig. 12. Splits, caused by nails, will first appear at the under side of the board

The splitting tendencies of different kinds of wood are important factors in the selection of wood for certain uses, notably boxes and crates, and frames to which upholstery is fastened in furniture. Splitting is controllable within limits by the shape of the nail point (See Fig. 11), the size of the nails, and the manner in which the nails are driven. Driving a nail tends to distort the fibers next to the nail downward, as shown in Figure 12, causing a downward accumulation of stress so that splitting makes its first appearance on the under side. Danger of splitting will be

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reduced if nails are staggered. Boring holes for nails also reduces the danger of splitting.

Splitting in Screwing (Hardwoods)

With wood screws in drilled holes the tendency is for any splits that develop to start on the upper side of the board. See Figure 13. The unthreaded portion just below the head exerts a wedging effect. Pronounced distortion of fibers alongside the screw is lacking. Some woods that split most readily with nails make a much better showing with screws. The following classification of woods is based on the percentage of screws of various sizes causing complete splits under drastic conditions, namely, in three-eighths in. air-dry stock, the screws being driven within three-fourths in. from the end.

Table Showing Comparative Splitting Tendencies in Screwing (Hardwoods)

Splits by 20 to 29 per cent of screws	*Splits by 30 to 39 per cent of screws*	*Splits by over 40 per cent of screws*
Ash	Gum, black	Basswood
Cottonwood	Gum, red	Beech
Elm, soft	Hackberry	Birch, sweet
Magnolia	Hickory	Buckeye
Oak, red	Maple, soft	Chestnut
Oak, white	Oak, chestnut	Maple, hard
Sycamore	Pecan	Tupelo
	Poplar, yellow	
	Willow	

Fig. 13. Splots caused by screws start on the upper face of the board

Bending

Bending strength is a measure of the load-carrying capacity of members that are ordinarily used in a horizontal position and rest on two or more supports. See Figure 14. Examples of members in which bending strength is important are barn rafters, girders, bridge stringers, wagon tongues, and scaffold platforms.

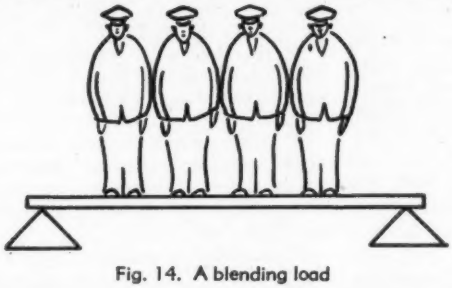

Fig. 14. A blending load

Table Showing Comparative Bending Strength

High	*Intermediate*	*Low*
Ash, white	Ash, black	Basswood
Beech	Cedar, eastern red	Cedar, northern white
Birch, yellow	Cypress, southern	Cedar, southern white
Cherry	Elm, soft	Cedar, western red
Douglas fir	Fir, white	Chestnut
Elm, rock	Gum, red	Cottonwood
Hickory, pecan	Hackberry	Fir, balsam
Hickory, true	Hemlock, eastern	Maple, soft
Larch, western	Hemlock, western	Pine, northern white
Locust, black	Pine, western white	Pine, ponderosa
Locust, honey	Poplar, yellow	Pine, sugar
Maple, hard	Redwood	Spruce, Engelmann
Oak, red	Spruce, eastern	
Oak, white	Spruce, Sitka	
Pine, southern yellow	Sycamore	
Walnut	Tupelo	

Even though a wood is low in bending strength it does not necessarily follow that it is unsuited for uses where this property is one of the essential requirements. It does indicate, however, that to obtain the same load-carrying capacity, larger sizes are required.

A small increase in the height of a beam produces a much greater increase in bending strength than it does in the volume. Thus, an increase of 1 in. in the height of a 10-in. beam will increase its volume 10 per cent, whereas the bending strength of the beam when set on edge is increased 21 per cent. An increase in the width of a beam, however, increases the volume and bending strength by the same percentage, that is, an increase of 1 in. in a beam 10 in. wide will increase both bending strength and volume 10 per cent.

No simple rule can be given to determine the size of girder, board, or plank required to carry a given load. In general, it may be said that for girders, the distance between the supporting posts in feet should not be greater than the height of the girder in inches. Lumber associations have prepared books that contain tables of safe loads for given spans, sizes, and qualities. Bulletin No. 145, "Light Frame House Construction," issued by the United States Department of Commerce, contains tables showing allowable loads for given spans and sizes, together with detailed instructions for the use of the tables.

The softwoods classed in the table showing comparative bending strengths, dominate the structural field. They are used for both heavy construction, such as barns and bridges, and light construction, such as dwellings and small farm structures. In heavy construction, softwoods in the intermediate class are used only occasionally. In light construction, softwoods in the intermediate class are used extensively. Their light weight and ease of working enable them to compete with the stronger woods. Woods classed as low are relatively unimportant in the structural field. They are seldom if ever used in heavy construction and only occasionally in light construction. The hardwoods in the high and intermediate classes have largely dropped out of the construction field not because they are unsuited to the use but because of their value for uses having more exacting requirements.

Stiffness

Stiffness is a measure of the resistance to bending or deflection under a load. See Figure 15. In the floor joists of houses and in studding, stiffness is more important than actual breaking strength because it is deflection that must be reduced to the minimum in order to avoid plaster cracks in ceilings and vibration in floors. Stiffness is important also in shelving, ladder rails, beams, ax handles, and long, slender columns. Whereas stiffness is of great importance in floor joists the actual advantages of using a species of relatively high stiffness will be lost if the members are not fully dry at time of installation so that the fastenings, bracing, and bridging hold well. Well-seasoned, well-bridged, and straight joists of a kind of wood that is relatively low in stiffness may be counted upon to give better results than a simply inherently stiff wood. If the wood is properly dry and the installation is good, however, species differences with respect to stiffness are important.

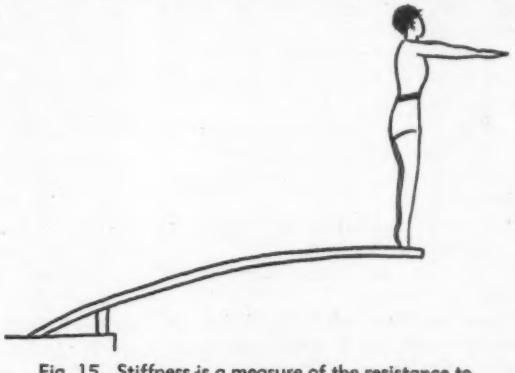

Fig. 15. Stiffness is a measure of the resistance to deflection and relates particularly to beams

Differences in stiffness between various woods may be compensated for by changing the size of members. Height and length of members have a greater effect on their stiffness than on other strength properties. A change of one thirty-second of an inch in the thickness of a standard 25/32-in. board produces a change of 12 per cent in the stiffness of the board laid flat in a floor. A 10-in. joist has about one fourth more wood in it than an 8-in. joist, but set on edge in a building it is more than twice as stiff.

In the opposite table, the various woods are classified in accordance with their stiffness. Softwoods classed as high and as intermediate, dominate the uses where stiffness is the most important requirement. When woods classed as low are used where stiffness is desired, it is because other properties are more important. The woods classed as high have the highest stiffness, but they are heavier and harder than those in the intermediate class. Light weight is quite commonly desired in combination with stiffness. The softwoods meet this requirement much better than the hardwoods, and softwoods in the intermediate class are often chosen in preference to those classed as high because the weight of the latter excludes them.

Stiffness is little affected by such defects as knots, checks, and shake. In light building construction, therefore, material of the sound, though knotty, grades may be used to good advantage for joists and studs because stiffness is more important than breaking strength in these items.

Table Showing Comparative Stiffness

High	*Intermediate*	*Low*
Ash, white	Ash, black	Cedar, eastern red
Beech	Basswood	Cedar, northern white
Birch, yellow	Cottonwood	Cedar, southern white
Cherry	Cypress, southern	Cedar, western red
Douglas fir	Elm, soft	Chestnut
Elm, rock	Fir, white	Fir, balsam
Hemlock, western	Gum, red	Hackberry
Hickory, pecan	Hemlock, eastern	Maple, soft
Hickory, true	Pine, western white	Pine, northern white
Larch, western	Poplar, yellow	Pine, ponderosa
Locust, black	Redwood	Pine, sugar
Locust, honey	Spruce, eastern	Spruce, Engelmann
Maple, hard	Sycamore	
Oak, red	Tupelo	
Oak, white		
Pine, southern yellow		
Spruce, Sitka		
Walnut		

(To be continued)

Testing and Tests

Tests and Measurements in Industrial-Arts

MARTIN J. BRENNAN, Jr.*

America's entry into the World War may be looked upon as the beginning of definite attempts to analyze the complex personal factors which make for efficiency in industrial pursuits. When this analysis was completed, a program was set up to test recruits for the selection of those who possessed the traits necessary to do the specialized tasks so essential to the success of a military campaign. (1)[1]

The results were used to classify all recruits into four grades of workers:

1. Those who possessed no trade knowledge or skill;
2. Those who showed a fair degree of proficiency in a trade;
3. Journeymen who were very proficient in a trade;
4. Expert workers who could be depended upon in a field emergency. (2)

When the time element is considered, this huge task was very well done, since there was a definite purpose for the testing program, and a direct application of the use of the test results; two of the main essentials for any well-founded testing program.

Thinking in an orderly fashion, it seems that it should naturally follow that educators would see the value of such a testing program, and make an immediate attempt to formulate a similar program for use in industrial-arts education. As it so often happens in the educational field, the practical and the obvious were overlooked, and the educators found it hard to divorce themselves from the aesthetic and cultural point of view, even in the industrial-arts field. Like the rise of the shop classroom from the basement to the ground floor, the growth of standardized testing in shopwork has been very, very slow.

The need for standardized testing is evident from the following example. In a 9B mechanical-drawing class, the grades were based upon the number of hours of work done, and the following note appeared on the grade-progress chart hanging in the room.

NOTE: Twenty hours' work equals one quarter.

The completion within one quarter of plates aggregating 20 hours' work, of "passing" quality (75 points), entitles the student to *Grade P* (75):

The completion of four hours' work beyond the required minimum, provided at least one plate equals the premium value in quality, entitles the student to a *Grade G* (85).

In the same way, the completion of eight hours' work beyond the required minimum entitles the student to *Grade G+* (90); and 12 hours' work to *Grade E* (95).

The instructor is the sole judge as to what shall constitute "passing" quality, premium value, and the number of jobs that must be completed by *all* students in 20 hours' time, or "they shall not pass!"

Contrast this grading system with one where a mechanical-drawing rating scale with a reliability coefficient of .90 is used, and the choice is obvious. Newkirk and Green (4) offer such a scale where the judgment of a skilled teacher is still a dominant factor, but there are 46 opportunities for him to exercise this judgment by inspection of the drawing, against 4 when the grades *P, G, G+*, and *E* are used with the hourly scale.

The following are excerpts from this mechanical-drawing rating scale, and will serve to show its usefulness:

"Directions: The information required to rate the items is obtained by inspection, quality scales, and physical measurement. . . ."

"The scale is divided into 10 equal parts. The right side indicates the highest mark; the center, average; the left, lowest."

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[1]All reference numbers refer to books, bearing similar numbers, listed in the bibliography at the end of this article.

"The total rating is the sum of all the item ratings which apply to the particular drawing."

Since the awarding of marks is a universal practice which will no doubt continue for a long time, the teacher should do his best to mark *on* achievement. It can readily be seen that if a grade for each rating scale is figured on a percentile basis, and a number of these grades compiled from the drawings completed by the student, the teacher will have a much more meaningful grade than if he guesses at *passing quality* and *premium value*, as required by the grade progress chart.

Not only does the rating scale give the teacher a more objective means for grading projects, but also gives the student a self-rating opportunity, if wisely used. Rating scales can be made up for other shop operations, such as sawing, soldering, splicing, and the like, and if used by the student during the performance of these operations, he will have a guide which will spur him on to greater achievement and perfection. *This is especially true if the student has a quality scale before him with which he can compare his work as he progresses.* The quality scale is not a new device, but just a refinement of the typical sample which is so prevalent in shops today, and which covers so much valuable wall space. The big difference in the two forms is that by using the quality scale, the student not only sees a finished product of good quality, but is also able to check his work as he progresses, with good and poor quality samples of the various steps leading up to the completion of the project. When these samples are arranged in the order of the poorest to the best, a scale can be calculated between the differences of successive samples and placed right on the sample board, starting with a 0 value for the poorest, and progressing with a linear scale of values up to the best. Again the student has something definite to "shoot at" and will be spurred on to do better work.

Tests are as useful in industrial arts for evaluating the outcome of instruction, as they are in academic fields, and many useful tests for this purpose have been developed. A typical example of this type of test is the Newkirk-Stoddard Home Mechanics Test (4), which tests objectively and analytically, the knowledge that the student should acquire from a well-organized course in home mechanics. The test is divided into two forms, *A* and *B*. Each form contains 36 jobs, which is half of the outstanding jobs in home mechanics, such as sharpening knives, installing hinges, connecting batteries, using glue, cutting pipe, etc. The use of such questions as the rearrangement question which follows, gives a good idea of what the test determines.

Example:

To cut a piece of pipe.

Procedure:

1. Set the cutter on the mark.
2. Ream the end.
3. Determine the length of pipe.
4. Cut the pipe.
5. Measure and mark.
6. Adjust the pipe cutter.

The manner in which the student rearranges the procedure steps will give the teacher an idea as to how well he has mastered the best procedure to follow when cutting a piece of pipe.

The validity of this test was established by pooling the results of:

1. Surveys to check the jobs on the basis of social utility;
2. Surveys of the teaching content of 75 representative schools;
3. Analyses of courses of study and widely used commercial job sheets which were based on surveys; and
4. Selection of jobs with procedures representative of a class of jobs, rather than a single job.

The reliability coefficient for each form ranges from .85 to .89 for the different grade levels. (1)

Erickson (5) states that the objectives of industrial-arts programs are grouped under three general headings: general education, exploratory, and prevocational. He subdivides the exploratory objective as follows:

a) To try out individual inclinations and abilities for industrial pursuits through typical experiences of various occupations.

b) To make reliable studies of the conditions, demands, and opportunities in related occupations.

c) To appreciate economic products by firsthand experiences in production work.

The problem of setting up a course of study to reach these objectives falls, of course, upon the shoulders of the shop teacher. Not a small job by any means, and one can readily see that to explore all the industrial fields and determine which one best suits a particular boy, becomes an impossible task. Therefore the teacher should select those branches of industry which are best adapted to school use, and in which the boys will receive the best training in tools and processes which are common to the greatest number of industries.

How shall a teacher secure facts which will tell him a particular boy is best fitted for a certain industry? Shall the shop teacher give the boy an electrical course because he shows an interest in electricity? In his adolescent stage, the same boy twelve weeks later may show an interest in chemistry. Does this mean he will make a good electrical engineer, or a good chemical engineer because he is interested in them over a period of 12 or 24 weeks? Thorndyke and others have produced experimental data showing a relatively low correlation between interest and ability. Bridges and Dollinger (6) found that interest and ability have a correlation coefficient of .25. This would indicate that interest ranks with guessing, in regard to choice of an industrial career. A boy cannot afford to select his life's work simply because he is interested in it; he must have definite information concerning his success with the tools which are common to the mechanical occupations of man, such as his ability to measure, hammer, saw, file, read drawings, and the like; what his percentage of error in his work is, and what his learning curve for each specific process or activity shows. The only way a boy can get this information is for the teacher to place it on a desk before the boy, and explain it to him. The only way a teacher can get this information to show the boy is by testing.

The shop teacher should do what the academic teacher is doing more and more each year: take advantage of the work of the pioneers in testing and measuring, and use standardized tests. Hull (7) says, "The recognition that if a test is to be of any particular value it must enable us to forecast a particular aptitude or group of aptitudes rather than measure some hypothetical or semi-metaphysical faculty, constitutes a great advance. . . ."

With the abandonment of the idea of measuring general intelligence as the goal of testing activity, there is now appearing a rigorous concentration upon the development of tests for a great variety of particular concrete aptitudes.

It is much more important that a boy know that he ranks in the upper quartile group in the acquisition of fundamental tool skills in respect to time consumed and proficiency acquired, than it is for him to know that he made a passing grade of *C* in woodwork. A good testing program will discover this for him, and there are enough good standardized tests on the market now for a teacher to select from if he is interested.

Social factors, being so important in the normal development of the individual, should receive considerable attention in the general scheme of education. In the school shop, students are exposed to situations which call for intelligent use of the individual's social and personality traits, and it is part of all teachers' jobs to see that these characteristics and traits are developed and guided into the proper channels. But how can a teacher do this if he knows no more about an individual's personality than what he can observe in the short time he has him in class? One of the devices which will help the teacher get a complete picture of the personalities of the students which he is working with is the Bernreuter Personality Inventory. (8) This form is not a test, but simply a method for collecting information which is used to indicate personality differences and deficiencies. There is no time limit set for completion of the form; it is self-administering, and each person interprets the questions for himself in the light of his own emotions and experiences.

The significance of the individual's responses to the questions is brought out by the use of four separate scales in the scoring of the answers: (1) neurotic

tendency; (2) self-sufficiency; (3) introversion-extroversion; and (4) dominance-submission. With such information on hand, the task of the teacher in helping the individual to adjust himself becomes a great deal easier because the students who are most likely to become disciplinary problems in the shop are brought to his attention before the disciplinary problem arises.

When the boys have completed their exploratory shop courses, and are ready for vocational guidance (usually the middle of the senior year in high school), the teacher or counselor in charge of guidance can help the individual better if he uses a vocational interest blank to help him in his guidance work. The Strong Vocational Interest Blank for men (11) (revised) is the best one on the market for this purpose. This form, when filled out by a boy, measures the extent to which his interests agree or disagree with those of successful men in a given occupation. The blank is divided into eight parts: occupations, school subjects, amusements, activities, peculiarities of people, order of preference of activities, comparison of interest between two items, rating of present abilities and characteristics. The eight parts comprise a total of 400 items which the boy must check. This provides the basis for a rather searching analysis of an individual's interests. I am inclined to believe the author when he says, " . . . Much wasted effort and time on the part of individual students, and much worry and disciplinary difficulty on the part of teachers would be avoided, if more attention were given to information of the type afforded by such inquiries into pupils' interests." (1)

Probably one of the best ways for the average shop teacher, whether he has had technical training in measurements or not, to become conscious of the real value of standardized testing is to apply to himself *A Test for the Shop Teacher,* by William L. Hunter. (9) This test has a calculated reliability of .97, and a group mean score of 78, and it should point out to the teacher that "the business of being a first-rate industrial-arts teacher requires a man who knows much, and who is eager to learn anything that might be of value to him in his professional career."

The following is a list of available shop tests which will be of value to the industrial-arts teacher. A grading chart (10) by which the shop teacher can evaluate samples of these tests before he gives them to his classes also is included.

Achievement test in mechanical drawing. Devised by J. C. Wright. (Bloomington, Ill.: Public School Publishing Co.)

Auto mechanics test. By W. L. Hunter. (Peoria, Ill.: Manual Arts Press.)

Badger mechanical drawing tests. (Bloomington, Ill.: Public School Publishing Co.)
Test 1 — Line work, dimensioning, lettering.
Test 2 — Projection, including sections and auxiliary views.
Test 3 — Pictorial drawing (isometric-cabinet-oblique). Tests separate.

Detroit manual ability task, Crockett's. (Bloomington, Ill.: Public School Publishing Co.) Consists of manual ability tasks or tests.

Electrical shop tests. By W. L. Hunter. (Peoria, Ill.: Manual Arts Press.) Series 1 — one part. Series 2 — one part.

Fowler foundry test. (Lafayette, Ill.: Lafayette Printing Co.) A paper test. Senior high school and college. One form.

Harter and Wells. Shop tests, series 1 and 2. Machine shop test, Printing test, Woodwork test. (Peoria, Ill.: Manual Arts Press.)

Industrial arts: Every pupil scholarship test. Bureau of Educational Measurements, Kansas State Teachers College, Emporia, Kans.

Instruction and information units for hand woodworking. Revised edition. By Douglas and Roberts. (Wichita, Kans.: McCormick-Mathers Co.) Tests 1–8.

Machine shop tests. By W. L. Hunter. (Peoria, Ill.: Manual Arts Press.) Series 1 — four parts. Series 2 — one part.

Machine shop test. (Peoria, Ill.: Manual Arts Press.)

Manchester semester-end achievement tests. Ninth-grade industrial arts. Bureau of Tests and Measurements, Manchester College, North Manchester, Ind.

Mechanical drawing test. By D. W. Castle. (Peoria, Ill.: Manual Arts Press.)

Mechanical drawing tests. By F. A. P. Fischer. (Milwaukee, Wis.: Bruce Publishing Co.) Two parts: I. Technical information. II. Performance tests.

Mechanical drawing. Bureau of Educational Measurements, Kansas State Teachers College, Emporia, Kans. One form — for end of one year's work.

Mechanical drawing performance test. By E. W. Baxter. (Milwaukee, Wis.: Bruce Publishing Co.) One form — High School.

Mechanical drawing tests. By W. L. Hunter. (Peoria, Ill.: Manual Arts Press.) Series 1 — two parts. Series 2 — two parts.

Mechanical drawing — Industrial arts tests for junior and senior high school. By H. B. Nash and R. R. Van Duzee. (Milwaukee, Wis.: Bruce Publishing Co.) Two forms.

Mechanical drawing test. By Wells and Laubach. (Peoria, Ill.: Manual Arts Press.)

Nash–Van Duzee industrial arts tests — woodwork. (Milwaukee, Wis.: Bruce Publishing Co.) One form.

Newkirk–Stoddard home mechanics test. Bureau of Educational Research and Service, State University of Iowa, Iowa City, Iowa. Two forms. For shop courses and guidance.

Partrick industrial arts tests. Practical Arts Publishing Co., 44 Vista Ave., Elizabeth, N. J.

Practical arts: Every pupil test. Ohio Department of Education, Columbus, Ohio. A new form twice each year. Grades 8–9.

Printing test. By W. L. Hunter. (Peoria, Ill.: Manual Arts Press.)

Printing tests (tentative). By Frank DiGiacomo. Stuart Junior High School, Washington, D. C.

Printing test. By George K. Wells. (Peoria, Ill.: Manual Arts Press.)

Related test for geometry (shop). By W. L. Hunter. (Peoria, Ill.: Manual Arts Press.) 25 items.

Shop tests. By W. L. Hunter. (Peoria, Ill.: Manual Arts Press.)
W–1. Tools test for woodwork.
W–2. Fastenings test for woodwork.
W–3. Comprehension test for woodwork.
W–4. Trade names test for woodwork.
W–5. Reading test for rule or scale.
W–6. True-false test for woodwork.
W–7. Completion test for woodwork.
W–8. Building parts test for carpentry.
MD–1. Reading test for mechanical drawing.
MD–2. Missing line test for mechanical drawing.
MS–1. Tools test for machine shop.
MS–2. Comprehension test for machine shop.
MS–3. True-false test for machine shop.
MS–4. Micrometer reading test.
E–1. Symbols test for electricity.
AM–1. Parts test for auto mechanics.

Shop Tests. Series No. 2. By W. L. Hunter. (Peoria, Ill.: Manual Arts Press.)
W– 9. Board measure test for woodworking.
W–10. Multiple-choice test for wood and lumber.
W–11. Reading test for a framing square.
W–12. Objective test for wood finishing.
W–13. Multiple-choice test for pattern-makers.
MD– 3. Lettering test for mechanical drawing.
MD– 4. True-false test for mechanical drawing.
MS– 5. Multiple-choice test for machine shop.
E– 2. Objective test for electricity.
AM– 2. Multiple-choice test for auto mechanics.
P– 1. Completion test for printing.
G– 1. Related test in shop English.
G– 2. Related test in shop mathematics.
G– 3. Related test for shop arithmetic.
G– 4. Related test for geometry.

Related test in shop arithmetic. By W. L. Hunter. (Peoria, Ill.: Manual Arts Press). 25 items.

Related test in shop English. By W. L. Hunter. (Peoria, Ill.: Manual Arts Press.) 25 questions.

Related test in shop mathematics. By W. L. Hunter. (Peoria, Ill.: Manual Arts Press.) 25 questions.

Woodworking tests. By W. L. Hunter. (Peoria, Ill.: Manual Arts Press.) Series 1 — 8 parts. Series 2 — 5 parts.

Sheet metal test. Department of Industrial Arts, Charleston, W. Va.

Wells–Laubach industrial arts test. (Peoria, Ill.: Manual Arts Press.)

Williamson industrial arts tests. Baltimore Department of Education, Baltimore, Md. 1931.
Sheet metal. Diversified shop — Electrical. Sheet metal. Woodwork. (Not published but copyrighted.)

Woodwork test. By George K. Wells. (Peoria, Ill.: Manual Arts Press.)

Wright mechanical drawing test. (Bloomington, Ill.: Public School Publishing Co.)

Rating Scale for Selecting Tests
(The score for a perfect test is 100.)

	Points
1. Is there a manual provided with the test?	5
2. Does the manual contain data on validity of test? Statistical — 8; Curricular — 7	15
3. Does manual give measures of reliability?	10

(Correlation coefficient; probable error of score. Reliability should be .90 for individual cases, .80 for comparison of groups.)

4. Reputation — Has it been widely used? 5
(Burrows' *Mental Test Yearbook* will give this.)
5. Ease of administration:
A. Preparation 4
B. Time limits 4
C. How much explanation is needed for students and proctors? 3
D. Alternate forms 4 15
6. Ease of scoring — objectivity — does the teacher have to make decisions? 15
7. Ease of interpretation:
A. Are norms provided?..... 5
B. Directions for interpreting material (does it give examples how to use?)..... 4
C. Is a class record provided?. 1
D. Application of results (does manual give instructions for applying results?)..... 5 15
8. Are tests put up in convenient packages? 5
(Size and number)
9. Typography and make-up:
A. Is type legible?..... 2
B. Is it crowded?..... 2
C. Is the paper good?..... 2
D. Will paper erase?..... 2
E. Form of make-up to prevent advance work 2 10
10. Does publisher provide test services? 5
A. Recommendations as to best tests to use.
B. Will he help to interpret results?

Total number of points.... 100

Bibliography

(1) Greene, H. A., and Jorgenson, A. N., *The Use and Interpretation of High School Tests* (New York: Longmans, Green, and Company, 1936).
(2) Chapman, J. C., *Trade Tests* (New York: Henry Holt & Company, 1921).
(3) Committee report, *Standards of Attainment in Industrial Arts Teaching* (Washington, D. C.: American Vocational Assn., 1934).
(4) Louis V. Newkirk and Harry A. Greene, *Tests and Measurements in Industrial Education* (New York: John Wiley & Sons, Inc., 1935).
(5) Erickson, E. E., *Teaching Problems in Industrial Arts* (Peoria, Ill.: The Manual Arts Press, 1930).
(6) Bridges and Dollinger, *The Psychological Revue*, Vol. 27, 1920.
(7) Hull, H., *Aptitude Testing* (New York: The World Book Co., 1928).
(8) Bernreuter, Robert G., *The Personality Inventory*. Stanford University Press, Stanford University, Calif., 1931.
(9) Hunter, W. E., *A Test for the Shop Teacher*, INDUSTRIAL ARTS AND VOCATIONAL EDUCATION, Milwaukee, Wis., Nov., 1935.
(10) Dunlap, Jack, *Rating Scale for Selecting Tests*, 1939.
(11) Strong, Edward K., Jr., *Vocational Interest Blank for Men* (Revised). Stanford University Press, Stanford University, Calif., 1938.

Tests for Mechanical Insight

JOHN EDMUND CRAWFORD*

Technical schools are using various kinds of pretests these days to speed up the orientation process and save time, materials, and energy. Properly interpreted prognostic test data can cut out much failure and waste, and can provide more objective guidance toward better choice of courses by all students. The newer aptitude tests are relatively inexpensive to use. They can be properly administered and interpreted by any teacher or counselor who has experience in tests and measurements and an elementary knowledge of statistics, or who is willing to take the time to read a few of the very excellent books available in this field.

Structural Insight

The ability to rapidly and accurately deal with spatial relations has been shown to be the prerequisite and basis for training and working in such jobs as are held by the designer and draftsman, the architect and sculptor, the dentist, physician and surgeon, the watchmaker and expert mechanic. To the extent that an error in spatial relations will cause damage, the aptitude and ability for this insight is important to the job. In the case of the engineer, designer, and draftsman, this structural ability is paramount to success in the job. Without this ability, even though he has other requirements for such work, success is very doubtful.

Tests for Structural Insight

There are on the market many very helpful tests in this new area. Some of these tests and devices are listed here briefly with some data on their characteristics. They are grouped under two headings: paper form boards, which are paper-and-pencil tests; and regular assembly tasks and form boards which require actual physical manipulation of the parts. The paper tests can be given to a group. The others can be given to only one person at a time, but provide a better basis for estimating certain motor skills.

Paper Form Boards

1. *MacQuarrie Test for Mechanical Ability*. This test is composed of seven subtests: tracing, tapping, dotting, copying, locating points, visualizing surface contacts, and pursuing numbered lines through a mazelike pattern.

The scores on this test correlate .81 with mechanical work in school. Age norms are provided and special subtest norms are available for analysis of any total score. This test is excellent to locate the very low or very high degrees of general manual dexterity and ability to react to specifications, both of which are important phases of mechanical ability. It can be given to a group in about 25 minutes.

2. *O'Rourke Mechanical Aptitude Test*, parts I and II. This is a wide-range test of familiarity with tools and their uses, which can be shown to be generally traceable to an interest in mechanical contrivances and an aptitude for learning to manipulate them. Part I is pictorial in nature; part II is verbal, in multiple choice form. Present norms are based on the performance of 9000 young men entering mechanical occupations. The total test requires slightly over an hour to finish.

3. *Minnesota Paper Form Board*, forms A and B. This test is more tedious to score than the revised forms AA and BB (discussed next under item 4) but is probably a better instrument than the revised forms to test for planar visualization for spatial relations and eye-hand control. It consists of neatly printed outlines in which must be drawn the assembly positions of the parts shown beside each problem. This procedure allows no chance for guessing to enter the score, but makes the test difficult for rapid scoring. This test can be given in less than an hour. Significant norms are available.

4. *Revised Minnesota Paper Form Board*, forms AA and BB. This test presents 64 problems similar to those in the forms A and B (of item 3) but provides a five-choice response which is easier to do and to score. Its score data are dependable for prediction of schoolwork in shops needing this type of insight. Vocational and age norms are available. Time consumed in administering this test is about 30 minutes for a group.

Regular Form Boards

5. *Minnesota Spatial Relations Test;* form boards A, B, C, D. Each form consists of a long board from which has been cut 58 different small shapes. The problem in each case is to put all pieces back into their proper recesses, with as much speed as possible. This test measures speed and accuracy in discriminating size and shape. It is useful from grade VI to XII and up into adult levels. It is relatively independent of verbal intelligence and largely

*Somers Trade School, Pittsburgh, Pa.

free from influence of past experience. Very high reliabilities are reported. The test can be given to one person in less than an hour.

6. *Minnesota Mechanical Assembly Test*, long and short forms; short form (boxes 1 and 2) is adequate for the usual guidance problem. The short form has two long boxes, each subdivided into ten small compartments containing the test material. The box lids are used as work trays. Twenty dissembled mechanical contrivances are timed and scored in assembly, to get the total score. Facility in correctly assembling the parts, without any pictures of the objects to be made or any other instructions, is related to mechanical intelligence. When used in combination with other data, this test can furnish a very valid prediction of the accuracy, speed and quality with which intricate assembly work will be performed. The age norms and special occupational norms given for the test are very significant for guidance purposes. Time required to give it to a student will not exceed 40 minutes. Scoring is quite simple.

7. *Crawford Test for Tridimensional Structural Visualization.* This spatial relations form board presents the tested person with nine small blocks which he must assemble upon a special baseboard. The completed assembly involves simultaneous consideration of tridimensional relations. Correlation of scores on this test with I.Q. is negligibly low; correlation with teacher rating in drafting is significantly high, over .90. The test produces no age norms because it correlates very low with growth about 10 years. The occupational norms are based on scores of nearly 400 adult men in industrial-technical jobs. Designers average at standard score 6.4 on this test, percentile 92. Draftsmen average at SS–5.8, percentile 80.

Distributors of These Tests

The MacQuarrie test may be obtained from Southern California School Book Depository, 3636 Beverly Boulevard, Los Angeles, Calif.

O'Rourke's test may be obtained from Educational and Psychological Publishing Co., Washington, D. C.

The Minnesota Paper Form Boards are distributed by the Psychological Corporation, 522 Fifth Avenue, New York, N. Y.

The Minnesota Spatial Relations Test and Mechanical Assembly Test are distributed by Marietta Apparatus Co., Marietta, Ohio.

The Crawford Test for Structural Visualization is distributed by the Psychological Corporation.

Special Books

Most school libraries have copies of texts on mental testing and measurement. The ones listed here are representative of the many fine texts available:

D. G. Patterson et al, *Minnesota Mechanical Ability Tests* (Minneapolis: University of Minnesota Press, 1930).

W. Van D. Bingham, *Aptitudes and Aptitude Testing* (New York: Harper Brothers, 1937).

Helen J. Green, *A Manual of Selected Occupational Tests* (Minneapolis: University of Minnesota Press, 1933). (Bulletins of the Employment Stabilization Research Institute, Vol. 2, No. 3.)

INDUSTRIAL-ARTS TEST

Robert P. Jensen,
State Teachers College,
Emporia, Kans.

General Directions: Read the directions for each part and follow them. Answer easy items first, return to others later. You will have exactly 40 minutes.

Possible Score.....133. Number wrong and omitted.....
Final Score.....
Name..... School.....
Age..... Grade..... Date.....

Part I

Directions: Read the following sentences carefully. If a statement is true, place a (+) in the parentheses before the statement, as in example A below. If the statement is false, make a minus (—) in the parentheses, as in example B.

Examples: (+) A. America was discovered by Columbus.
(—) B. The first president of the United States was Lincoln.

( ) 1. T square and try square are different names for the same tool.
( ) 2. An expansive bit is used for boring holes larger than one inch.
( ) 3. A rip saw is used to cut with the grain of the wood.
( ) 4. Straight lines are always inked before curved lines.
( ) 5. An isometric drawing shows three plane surfaces.
( ) 6. Drawing dimensions are shown on the left and bottom of the views represented.
( ) 7. Dimension lines in mechanical drawing are shown heavier than object lines.
( ) 8. Working drawings are usually orthographic projections.
( ) 9. Wood filler should be applied with a soft brush.
( ) 10. A brush used in spirit stains is cleaned with alcohol.
( ) 11. Shellac is thinned with turpentine.
( ) 12. There are 1000 rivets in a pound of the one-pound size of tinners rivets.
( ) 13. Sulphuric acid may be used to clean the black scale from hot rolled steel.
( ) 14. The adjusting nut determines the width of line made by a ruling pen.
( ) 15. Wood is a good conductor of electricity.
( ) 16. Glass will not carry an electric current.
( ) 17. White pine is a soft wood.
( ) 18. Maple has a very open grain.
( ) 19. When paint is used on wood, the beauty of the grain is covered.
( ) 20. Wood should be sanded in the direction of the grain.
( ) 21. Oil is put on the oilstone to keep the tool from heating.
( ) 22. Both sides of the plane iron are ground as is the blade of a knife.
( ) 23. Iron wire is a better conductor of electricity than aluminum wire.
( ) 24. The heating element in a toaster is made of copper.
( ) 25. Fuses are used to prevent shocks.
( ) 26. The human body is a conductor of electricity.
( ) 27. The common passenger-car battery is a 12-volt battery.
( ) 28. A permanent magnet is made of soft iron.
( ) 29. No. 4/0 is a coarse sandpaper.
( ) 30. A riveted seam is watertight.
( ) 31. A center punch is used to punch holes in sheet metal.
( ) 32. For metalwork emery cloth is better than emery paper.
( ) 33. Water and air cause oxides to form on iron.
( ) 34. Copper is galvanized to prevent it from rusting.
( ) 35. The hack saw is used to saw iron.
( ) 36. Galvanized iron will not rust.
( ) 37. Annealing copper or brass is done to harden the metal.
( ) 38. The metal in a hack-saw blade is harder than the metal it cuts.
( ) 39. The purpose of the flux in soldering is to hold the metals together.
( ) 40. A cold chisel is sharpened at a 20° angle.
( ) 41. Tin cans are made of hardened tin.
( ) 42. Bronze is made from copper and zinc.
( ) 43. A twist drill is used to drill holes in metal.
( ) 44. Oily rags from the shop should be kept in a fireproof container.
( ) 45. The surplus wood filler should not be removed from the wood until it has set one hour.
( ) 46. Wood filler should be removed across the grain with a coarse cloth.
( ) 47. A varnish surface is sanded between coats.
( ) 48. A number 8 wood screw is larger in diameter than a number 6 wood screw.
( ) 49. The number on an auger bit indicates the size in sixteenths of an inch.
( ) 50. Varnish is thinned with turpentine.
( ) 51. A plane bit is sharpened with a file.
( ) 52. Box nails are made of lighter wire than common nails.
( ) 53. In woodwork a chamfer is the same as a bevel.
( ) 54. Heartwood of a tree is harder than sapwood.
( ) 55. The size of screws is given in length and wire-gauge number.
( ) 56. Miter joints are usually used in the construction of picture frames.
( ) 57. Kiln-dried lumber is better for furniture than air-dried lumber.
( ) 58. Plain-sawed lumber costs more per foot than quartersawed lumber.
( ) 59. For wood floors plain-sawed lumber is more desirable than quartersawed lumber.
( ) 60. Varnish will set in a shorter time than shellac.

( ) 61. The clearance angle of a twist drill is from 12 to 15 degrees.
( ) 62. The lip angle of a twist drill is 75 deg.
( ) 63. Auger bits are ordinarily used in a hand drill.
( ) 64. Oil is the best lubricant for drilling holes in cast iron.
( ) 65. Most iron in the United States is found in the state of Minnesota.
( ) 66. Most tools are made from cast iron.
( ) 67. Cast iron contains no carbon.
( ) 68. In mechanical drawing hidden lines are unbroken lines.
( ) 69. Object lines represent the outline of the object.
( ) 70. Forty-two inches is correctly represented as (3′6″).
( ) 71. The height of an object is shown on the front view.
( ) 72. Arrowheads are placed on the ends of dimension lines.
( ) 73. Triangles are used in drawing horizontal lines in mechanical drawing.
( ) 74. Dimension lines should touch object lines.
( ) 75. Ruling pens are filled by dipping them into the ink.
( ) 76. Projection lines are usually very light.
( ) 77. If a current is passed through a coil of wire, this coil becomes a magnet.
( ) 78. The outside shell of a dry-cell battery is made of tin.
( ) 79. The watt is a unit of measure for electrical power.
( ) 80. The flow of electricity is measured in amperes.

Part II

Directions: Place the number of the part which makes the best answer to the statement in the parentheses before the sentence, as in the example.

Example: (3) The capital of the United States is: (1) Boston. (2) Chicago. (3) Washington.

In this example "Washington" is the correct answer:

( ) 81. What other type of nail does the brad resemble? (1) Box nail. (2) Finishing nail. (3) Casing nail. (4) Lath nail. (5) Common nail.
( ) 82. In what unit of measure is lumber sold? (1) Pound. (2) Board foot. (3) Square foot. (4) Cord. (5) Yard.
( ) 83. What wood is best suited for bench tops? (1) Basswood. (2) Maple. (3) Pine. (4) Oak. (5) Hickory.
( ) 84. Common nails are driven with what tool? (1) Mallet. (2) Ball-peen hammer. (3) Tack hammer. (4) Claw hammer. (5) No possible answer.
( ) 85. What size hole will a number 8 auger bit bore? (1) ⅛ in. (2) ¼ in. (3) 8/32 in. (4) 1 in. (5) No possible answer.
( ) 86. What term is used to denote electrical pressure? (1) Watt-hour. (2) Kilowatt-hour. (3) Volt. (4) Ohm. (5) Ampere.
( ) 87. What will be the cost of one board foot of lumber at $100 per thousand? (1) 1c. (2) 10c. (3) $1. (4) $10. (5) No possible answer.
( ) 88. What materials do the abbreviations F. H. B. apply to? (1) Nails. (2) Hammers. (3) Wood screws. (4) Hardwoods. (5) No possible answer.
( ) 89. What plane is most commonly used in woodwork? (1) Block plane. (2) Jointer plane. (3) Jack plane. (4) Fore plane. (5) No possible answer.
( ) 90. How many board feet in a board 1″×6″×18′? (1) 3. (2) 6. (3) 9. (4) 18. (5) No possible answer.
( ) 91. How many board feet in a board 2″×4″×36″? (1) 1. (2) 2. (3) 3. (4) 4. (5) 5.
( ) 92. The cutting angle for woodworking tools is: (1) 60°. (2) 30°. (3) 20°. (4) 45°. (5) 10°.
( ) 93. Which one of the following glues is waterproof? (1) Animal. (2) Casein. (3) Fish. (4) Le-Pages. (5) No possible answer.
( ) 94. Which type of glue should be applied hot on woodwork? (1) Animal. (2) Casein. (3) Fish. (4) No possible answer.
( ) 95. Before applying a finish which of the following woods require a filler? (1) Pine. (2) Maple. (3) Walnut. (4) Cherry. (5) No possible answer.
( ) 96. What metal is used in the plates of a car storage battery? (1) Iron. (2) Copper. (3) Zinc. (4) Lead. (5) Tin.
( ) 97. What is the name of the sheet-metal machine on which cylindrical forms are shaped? (1) Turning machine. (2) Bar folder. (3) Forming roll. (4) Cornice break. (5) No possible answer.
( ) 98. What wood-turning tool is used to turn off rough corners of stock? (1) Roundnose. (2) Cutoff. (3) Skew. (4) Gouge. (5) No possible answer.
( ) 99. Of the following lines used in drawing, which is the heaviest? (1) Border. (2) Object. (3) Extension. (4) Dimension. (5) Center.
( ) 100. What size of fuse is commonly used for a 110-volt light circuit? (1) 5. (2) 15. (3) 30. (4) 50. (5) No possible answer.

Part III

Directions: From the list of answers in Column II select the word which matches each item of Column I, and write the number of the answer in the parentheses at the left of the item. The items of one section may be matched only with the answers in Column II of the same section. The example has been correctly marked.

Example: (27) A fuel used in automobiles.

Column I	*Column II*
( ) 101. A high carbon steel	1. armature
	2. auger bit
( ) 102. A method of making steel	3. Birmingham
	4. blast furnace
( ) 103. The two highest grades of hardwood lumber	5. carbide
	6. cast iron
( ) 104. A common electrical insulating material	7. coping
	8. copper
( ) 105. The part of an electric motor which rotates.	9. die
	10. F. A. S.
( ) 106. The chief iron and steel center of the South	11. 40
	12. Georgia
( ) 107. The furnace used to smelt iron ore	13. gimlet bit
	14. H. W. B.
( ) 108. The product of the blast furnace	15. 110
	16. open hearth
( ) 109. The metal in a lamp bulb filament	17. pig iron
	18. porcelain
( ) 110. The voltage of the common light circuit	19. tap
	20. thread gauge
( ) 111. A type of saw used to cut curves in a thin wood	21. tool steel
	22. tungsten
( ) 112. The number of degrees in the cutting angle for the lip of a cold chisel	23. twist drill
( ) 113. The tool used to bore holes in wood	24. 220
( ) 114. The tool used to drill holes in metal	25. wood
( ) 115. The tool used to cut inside threads	26. 60
( ) 116. The tool used to cut outside threads	27. gasoline
( ) 117. A polishing agent used on metals	1. ash
	2. basswood
( ) 118. A substance used in the blast furnace to remove impurities	3. birch
	4. burnisher
( ) 119. A tool used in sharpening a hand scraper	5. cedar
	6. framing square
( ) 120. The woodworking tool used to test the edge of a board for squareness	7. gasoline
	8. gumwood
( ) 121. The part of the auger bit that draws it into the wood	9. helical
	10. isometric
( ) 122. The metal used with tin in making common solder	11. jointer
	12. lead
( ) 123. The metal added to hydrochloric acid to make cut acid flux	13. level
	14. limestone
( ) 124. The flux used in soldering tin plate	15. maple
	16. nitric acid
( ) 125. A common substance used to neutralize acid burns	17. pewter
	18. rosin
( ) 126. The lumber that is said to help prevent moths	19. router
	20. sandpaper
( ) 127. The lumber that sometimes contains a fig-	21. soda

ure called bird's-eye.

( ) 128. The giant trees of California — 22. spruce

( ) 129. The wood used in most drawing boards — 23. spur

( ) 130. The power tool used to prepare edges of boards for glueing. — 24. redwood

( ) 131. The tool used to test horizontal surfaces in house construction — 25. tripoli

( ) 132. The most common wood for dowel rods — 26. try square

( ) 133. A type of drawing — 27. zinc

PERCENTILE EQUIVALENTS OF INDUSTRIAL-ARTS TEST SCORES

Possible score 133 Highest score 124 Lowest score 44 — No. of cases 1250 Total tests distributed 2900

Score	Percentile Equivalent	Score	Percentile Equivalent
115	99	84	45
107	95	82	40
102	90	80	35
99	85	78	30
96	80	76	25
94	75	74	20
92	70	71	15
91	65	68	10
89	60	63	5
87	55	54	1
86	50		

Key

Papers must be scored according to this key. Give one point for each correct answer. An omission is counted as an error. Possible score 133.

Part I

1. —	21. —	41. —	61. +
2. +	22. —	42. —	62. —
3. +	23. —	43. +	63. —
4. —	24. —	44. +	64. —
5. +	25. —	45. —	65. +
6. —	26. +	46. +	66. —
7. —	27. —	47. +	67. —
8. +	28. —	48. +	68. —
9. —	29. —	49. +	69. +
10. +	30. —	50. +	70. +
11. —	31. —	51. —	71. +
12. +	32. +	52. +	72. +
13. +	33. +	53. —	73. —
14. +	34. —	54. +	74. —
15. —	35. +	55. +	75. —
16. +	36. +	56. +	76. +
17. +	37. —	57. +	77. +
18. —	38. +	58. —	78. —
19. +	39. —	59. —	79. +
20. +	40. —	60. —	80. +

Part II

81. (2)	86. (3)	91. (2)	96. (4)
82. (2)	87. (2)	92. (2)	97. (3)
83. (2)	88. (3)	93. (2)	98. (4)
84. (4)	89. (3)	94. (1)	99. (1)
85. (5)	90. (3)	95. (3)	100. (2)

Part III

101. (21)	110. (15)	119. (4)	128. (24)
102. (16)	111. (7)	120. (26)	129. (2)
103. (10)	112. (26)	121. (23)	130. (11)
104. (18)	113. (2)	122. (12)	131. (13)
105. (1)	114. (23)	123. (27)	132. (3)
106. (3)	115. (19)	124. (18)	133. (10)
107. (4)	116. (9)	125. (21)	
108. (17)	117. (25)	126. (5)	
109. (22)	118. (14)	127. (15)	

TEST ON THE FUNDAMENTALS OF MECHANICAL DRAWING

W. H. Bowers,
High School,
Tuckahoe, N. Y.

The following test is given to ascertain your knowledge concerning the fundamentals of mechanical drawing. This is not a test for speed, so read each question carefully before attempting to answer it.

Any question erased will be considered wrong.

You are not permitted to leave the room, visit with anyone, or talk during this test.

Directions: This test consists of 100 statements. Some of them are true, some of them false. If you think the statement is a true one place a *T* before the question. If you think the statement is false, place an *F* before the question.

1. All lines on a mechanical drawing are thin lines.
2. Dotted lines show visible edges of a drawing.
3. Object lines point out the size of a drawing.
4. Extension lines always touch the views.
5. There are 360 degrees in a circle.
6. A right angle has 180 degrees.
7. A 4H pencil is the correct one for all-round purposes.
8. The drawing pencil should resemble a darning needle when sharpened.
9. Mechanical drawing is called the language of the professional pursuits.
10. Mechanical drawing is practically the same in every country.
11. A mechanical drawing isn't any better than its lettering.
12. Guide lines are always used as an aid to good printing.
13. Straight line vertical capitals are used in all drawings in this school.
14. Three views are usually used when drawing circular objects.
15. Section lines are used for centering circles.
16. The diameter equals the distance around the circle.
17. Radius means the distance through the center of a circle.
18. When drawing circular objects all lines are thin.
19. Two circles may be tangent to each other.
20. A curve is never tangent to a straight line.
21. A sectional view shows the inside of an object.
22. Crosshatching lines are drawn at a 45-deg. angle.
23. Section lines are ⅛ in. apart.
24. Section lines are spaced with a ruler or scale.
25. Section lines are light lines.
26. Sectional views are used extensively by manufacturers to display motor parts.
27. It is possible to build a house from an isometric drawing.
28. Three surfaces are shown on an isometric drawing.
29. The principal lines on an isometric drawing are at a 60-deg. angle.
30. A working drawing and an isometric are the same.
31. Isometric drawings give a good picture of an object in its entirety.
32. The working drawing is used in all branches of industry.
33. A working drawing usually consists of three views.
34. Dimension lines may be dispensed with on most drawings.
35. A dimension line always touches the extension line.
36. Arrows are placed at the ends of extension lines.
37. The end view is directly under the top view.
38. The top view is always over the front view.
39. The top view and the side view are the same in width.
40. The top view and the front view are always the same in length.
41. The dimension line which shows the length of the piece is always placed over the side view.
42. A dimension line pointing out the width is usually placed between the top and front view.
43. A dimension line is used to tell the size.
44. Three triangles are used in mechanical drawing.
45. There are two 45-, and one 90-deg. angle on one of the triangles.
46. A 30-deg., a 75-deg., and a 90-deg. angle are on one triangle.
47. The T Square is used for drawing vertical lines.
48. The 45-deg. triangle is used when drawing horizontal lines.
49. The head of the T Square is held in contact with the right edge of drawing board.
50. The artgum eraser is used for rubbing out inked lines.
51. Dimension lines are 3/16 in. apart on all drawings.
52. Dimension lines are usually heavy lines.
53. A three-view drawing should be placed in the center of the drawing paper.
54. The distance between views is always the same.
55. Working drawings are practically always in the form of blueprints in a factory.
56. A blueprint must be made from an inked drawing.
57. The dimension and extension lines should be in the background on a good blueprint.
58. A blueprint is usually made on a machine in a factory.
60. Many years ago blueprint making was entirely dependent on the weather.
61. When inking, always make the circles and arcs first.
62. It is possible to erase large ink blots with a pencil eraser.
63. Dimension lines and section lines are thin lines.
64. Object lines and extension lines have the same value on a drawing.
65. The lettering is always done with the ruling pen.
66. The ruling pen is filled by means of a quill.
67. The best method of erasing on inked drawings is to use a knife.
68. A mechanical drawing is always made full size.
69. The protractor is a device used for computing the diameter of a circle.
70. A protractor resembles an erasing shield.
71. An erasing shield is an instrument used to protect inked lines when making erasures.
72. The irregular curve is often called a French curve.
73. An irregular curve is used when drawing circles.
74. The irregular curves are obtainable in many shapes and sizes.
75. The same conventions are used when

breaking square material or round material on a drawing.
76. There are nine 45-deg. angles in a circle.
77. There are six 60-deg. angles in a circle.
78. There are thirteen 30-deg. angles in a circle.
79. It is considered good practice to complete the drawing before doing the lettering.
80. The correct way to draw vertical lines is to use the T square.
81. Vertical letters are used in many drawing rooms instead of inclined letters.
82. When using a French curve the line drawn should pass through at least three points.
83. A draftsman's triangle is used to draw arrowheads.
84. The sum of the degrees in the 30–60 deg. triangle is 90 deg.
85. Each circle on a working drawing must show two center lines.
86. The front view of a circle appears as an ellipse.
87. Circles are located by their centers.
88. Center lines should extend about ¾ in. beyond the views.
89. Most working drawings have five views.
90. A 90-deg. angle is a straight angle.
91. The scale, 3 in. to a foot, means that the object is drawn one-quarter size.
92. The scale, ½ in. equals a foot, means that the object is drawn to a size of one twenty-fourth.
93. An isometric drawing consists of three views.
94. A semicircle equals 180 deg.
95. The draftsman can save time by making use of conventional breaks.
96. Center lines are made to show the center of circle.
97. The color of fresh blueprint paper is greenish yellow.
98. It is better and more desirable to make tracings on tracing cloth rather than on tracing paper.
99. A blueprint is a photograph produced on paper treated with blue water color.
100. The most important member of the drafting profession is the designer.

Key for Test

1. False	26. True	51. False	77. True
2. False	27. False	52. False	78. False
3. False	28. True	53. True	79. True
4. False	29. False	54. False	80. False
5. True	30. False	55. True	81. True
6. True	31. True	56. False	82. True
7. True	32. True	57. True	83. False
8. True	33. True	58. True	84. False
9. False	34. False	60. True	85. True
10. True	35. True	61. True	86. False
11. True	36. False	62. True	87. True
12. False	37. False	63. True	88. True
13. True	38. True	64. False	89. False
14. False	39. True	65. False	90. False
15. False	40. True	66. True	91. True
16. False	41. False	67. False	92. True
17. False	42. False	68. False	93. False
18. False	43. True	69. False	94. True
19. True	44. False	70. False	95. True
20. False	45. True	71. True	96. True
21. True	46. False	72. False	97. True
22. True	47. False	73. False	98. True
23. False	48. False	74. True	99. False
24. False	49. False	75. False	100. True
25. True	50. False	76. False	

MID-TERM TEST IN GENERAL METALWORK

W. H. Bowers,
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This is a test to find out how much you know regarding processes, tools, materials, and other information used in general metal. Ask no questions after the test begins. Read each question carefully.

Directions: This test consists of a number of statements, some of which are true, some false. If you think the statement is true, place a *T* before the question. If you think the statement is false, place an *F* before the question. Do not guess. Your score is 100 per cent if you answer all statements, correctly.

1. The jeweler's saw is used extensively in cutting band iron.
2. The teeth of a jeweler's saw point toward the handle.
3. The teeth of a hack saw point toward the handle.
4. Copper rivets are harder than iron rivets.
5. Aluminum rivets come in one size only.
6. Escutcheon pins may be used in place of rivets.
7. Copper is an alloy of brass.
8. Brass is an alloy.
9. The largest copper mines in the world are in Montana.
10. Pewter is easily soldered.
11. Pewter is harder than copper.
12. Pewter is very expensive.
13. Handmade pewter articles command a high price.
14. Band iron can be bent cold.
15. Band iron is inexpensive.
16. Fireplace andirons may be purchased cheaply, at any art stores.
17. A jig is used for bending band iron.
18. A scriber is used to draw lines on metal.
19. Chasing tools are used for cutting brass.
20. Chasing tools come in many sizes.
21. The caliper is used for measuring the length of a piece of stock.
22. A micrometer is used for determining the exact diameter of a piece of stock.
23. A hair can be measured with a micrometer.
24. Art-metal hammers can be obtained in many sizes.
25. Art-metal hammers are often made of wood.
26. Peening can be done with a machinist's hammer.
27. Small punches are often used for peening.
28. Pewter is used extensively for making jewelry.
29. Nickel silver is harder than pewter.
30. Pewter is usually annealed.
31. Nickel silver is annealed when forming bracelets.
32. Nickel silver can be cleaned with nitric acid.
33. The rivet set is used for bending band iron.
34. Rivet sets come in one size only.
35. A Stillson wrench resembles the monkey wrench in appearance.
36. The tin snips may be used for cutting brass or copper.
37. Twenty-gauge brass can be cut with the tin snips.
38. Tin snips are available in many different lengths.
39. Thirty-two-ounce copper is heavier than 20-gauge brass.
40. Galvanized iron resembles tin in appearance.
41. Galvanized iron is used for making funnels and pails.
42. It is easier to solder pewter than it is to solder tin.
43. Rosin is used to solder brass and copper.
44. Pewter soldering requires more heat than copper soldering.
45. The micrometer gives a more accurate measurement than a caliper.
46. The early lathes were used only for metal turning.
47. It is possible to turn wood on the engine lathe.
48. The engine lathe is the most useful machine in the metalworking industry.
49. Only one type of work is possible on the engine lathe.
50. Several types of threads may be cut on the engine lathe.
51. The engine lathe has only one speed.
52. The engine lathe is less expensive than the drill press.
53. The drill press is often used for knurling.
54. Large holes are always bored at a fast speed on the drill press.
55. Holes may be bored at many angles, on the drill press.
56. Any size drill may be held in the drill-press chuck.
57. The use of pewter started in the palaces of the kings.
58. The major part of pewter during the early centuries was made of lead.
59. Metal trim is rapidly taking the place of wood in buildings.
60. Tin roofs are not durable.
61. Tin is obtained in large quantities from the mines in New Hampshire.
62. Tin is cheap in comparison with copper, brass, or pewter.
63. Galvanized iron is black iron covered with zinc.
64. Hand forging is rapidly disappearing as a trade.
65. The old type blacksmith shop exists today.
66. Most of the workers in a large automobile factory are skilled mechanics.
67. Most of the skills required to work in an auto factory require at least three years to master.
68. The piecework system is rapidly taking the place of the daywork system in large auto plants.
69. Courses in commercial education are of the utmost value to a boy who is planning on entering the auto industry.
70. The outlook for the auto industry isn't very bright in the United States.
71. Rough castings are made by the machinist.
72. Flasks are usually held together with pins.
73. The molders work is heavy and dirty.
74. The work of a coremaker and a molder are exactly the same.
75. The molder receives good wages and considerable overtime.
76. Many schools are training boys to be molders.
77. The work of a machinist is the same today as it was 20 years ago.
78. A machinist can learn the trade in nine months.
79. All-round machinists and good tool makers are rare today.

80. Chipping, filing, and scraping require a high degree of skill.
81. The assembler in a machine shop holds a very responsible position.
82. The work of a machinist is very dangerous.
83. Mechanical drawing is a necessity to all machinists.
84. The word *plumber* is derived from the Greek word *plumbarius*.
85. The bathtub is a modern invention.
86. The "Black Death" during the dark ages was due to unsanitary conditions.
87. There is a constant demand for plumbers.
88. A plumber's work is dirty and often unpleasant.
89. The field for advancement is unlimited for a plumber.
90. The plumber is a skilled, highly paid mechanic.
91. The plumber unions are affiliated with the C.I.O.
92. A piece of copper is annealed for the purpose of making it harder.
93. Tools used for cutting, seaming, and hammering are made of high carbon steel.
94. The nature of steel can't be changed by heat treatments.
95. When iron is heated it expands.
96. The strength of a piece of material is ascertained by applying a load sufficient to produce strain or fracture.
97. Tenacity is generally expressed in pounds or tons per square inch.
98. The strength of any material, piece, machine, or structure, is the strength of its strongest part.
99. If one piece bears upon another so as to cause mutual separation, it is said to shear.
100. Strengths are classified according to the kind of force acting upon the piece of material or mechanism to produce stress.

Key for Test

1. False	26. True	51. False	76. False
2. True	27. True	52. False	77. False
3. False	28. False	53. False	78. False
4. False	29. False	54. False	79. False
5. False	30. False	55. True	80. True
6. True	31. True	56. False	81. True
7. False	32. True	57. True	82. False
8. True	33. False	58. False	83. True
9. True	34. False	59. True	84. False
10. False	35. False	60. False	85. False
11. False	36. True	61. False	86. True
12. True	37. True	62. True	87. True
13. True	38. True	63. True	88. True
14. True	39. True	64. True	89. True
15. True	40. False	65. True	90. True
16. False	41. True	66. False	91. False
17. True	42. False	67. False	92. False
18. True	43. True	68. True	93. True
19. False	44. False	69. False	94. False
20. True	45. True	70. False	95. True
21. False	46. False	71. False	96. True
22. True	47. True	72. True	97. True
23. True	48. True	73. True	98. False
24. True	49. False	74. False	99. True
25. True	50. True	75. True	100. True

GENERAL TEST FOR GIRLS HOME MECHANICS

George L. Simnicht,
Luverne, Minn.

Directions: Insert the correct word or phrase in the blank spaces provided.

Example: A hammer is used to drive nails.

1. What three views are usually drawn in simple working drawing, a..... b..... c.....
2. Everything that occupies space has ..... dimensions.
3. By ..... is meant the cutting of a piece of wood to dimension.
4. What tool is used to test a board for squareness .....
5. There are ..... faces on a cube.
6. When squaring a board what part is squared first .....
7. A .... should be used to cut on in the kitchen.
8. A good kitchen knife should have a ..... blade but still be strong enough to perform its services.
9. ..... is used to cool a knife during the process of grinding.
10. Be sure to protect your ..... when grinding.
11. A common grindstone is made of ..... stone.
12. In grinding a knife the wheel should turn ..... the cutting edge.
13. When regluing furniture the..... should fit perfectly.
14. Some type of ..... must be applied to hold the work in place.
15. If clamps are not available a ..... may be used.
16. With a soft cloth and ..... remove all surplus glue.
17. The groove made by a saw is called the .....
18. Paints and enamels are used to coat surfaces to make them more ..... and more .....
19. Paints are made to be used on either the ..... or ..... of buildings.
20. ..... covers the surface and gives a smooth, glossy finish without changing the color.
21. Two materials that may be used to fill holes before applying paint are ..... and .....
22. An undercoat should be ..... in color than the paint which is to be put over it.
23. The better paint brushes are ..... with ..... bristles.
24. Fill the brush with paint by dipping it ..... of its length in the paint.
25. If knots show, give them a coat of ..... to prevent their bleeding through.
26. The first coat of paint should be..... before the second coat is applied.
27. Outside paint should be thinned with .....
28. ..... or ..... coats of varnish will give a satisfactory finish for most furniture.
29. Inside paint should be thinned with .....
30. It will usually take about ..... hour to mix a gallon of paint.
31. ..... varnish should be used on a table top.
32. To repaint a kitchen chair I would use .....
33. The best paint brushes are made of bristles taken from the .....
34. List two things which are good to clean paint brushes ....
35. ..... paint brushes are seldom economical.
36. ..... is used to clean shellac brushes.
37. .... is used to fill the pores in open-grained wood.
38. List three types of stains, ..., ..., and .....
39. Rags saturated with ..... may cause fire by spontaneous combustion.
40. ..... is used around the edges of upholstered pieces to cover up the tacks.
41. Springs should be ..... to hold them in their correct position.
42. ..... may be used for rough filling for upholstering.
43. The best and most expensive type of padding material is .....
44. The final or top padding material should be .....
45. .... is the best liquid to use for cleaning spots on upholstered furniture.
46. ..... and ..... are two kinds of carpet cleaners.
47. ..... and ..... are two kinds of hardwood commonly used for floors.
48. The first layer of boards on a floor is called the .....
49. Thin ..... is used to seal the pores of the wood on floors.
50. ..... coats of varnish should be applied.
51. Apply a liberal coat of ..... as a final coating.
52. ..... linoleum carries the design and color through to the backing.
53. ..... is the most expensive type of linoleum.
54. ..... linoleum is of solid color and the color goes through to the backing.
55. ..... linoleum is the cheapest type.
56. ..... paper may be used as a cushion for linoleum.
57. ..... and ..... are two materials which may be used to treat linoleum.
58. Holes in linoleum may be filled with .....
59. Plaster is a mixture of ..... and .....
60. ..... is a common binding material for plaster.
61. The small boards or strips on which the plaster over the walls are called .....
62. Plaster is generally applied in ..... coatings.
63. Small holes in plaster may be repaired by using ..... plaster.
64. For patching very small holes plaster ..... may be used.
65. A ..... is the tool used for plastering.
66. When patching wallpaper, the paper should be ..... rather than cut.
67. ..... and ..... are two materials from which nonrusting screen is made.
68. To prevent discoloration of screen they may be coated with .....
69. ..... joints should be used in making good window screens.
70. Joints on a screen door should be ..... and .....
71. Most screen frames are made of ..... wood.
72. A new screen should have at least ..... coats of paint.
73. ....., ..., and ..... are three of the most common types of front-door locks.
74. All standard and well-made locks are made of .....
75. Should these locks be oiled .....?
76. A lead pencil may be used to ..... locks.
77. ..... should be used to eliminate friction in inside door hinges.

78. A skeleton key will usually fit a ..... lock.
79. ..... locks are generally used on inside doors of schools, etc.
80. The domestic use of electricity has increased at least to ..... times its 1920 consumption.
81. City ordinances usually require that an electrical installation be .....
82. An ..... link in a socket pull chain is good to have in a bathroom.
83. If trouble arises in the wiring of your home you should ..... immediately.
84. The ..... hour is the unit used to measure the amount of electricity used.
85. The ..... is the unit of electrical pressure.
86. The ..... is the unit of electrical resistance.
87. One thousand ..... is equal to one .....
88. One horsepower unit equals 746 .....
89. The device used to measure electrical power consumption in the home is the .... meter.
90. This meter is simply a small .....
91. The ..... is the unit used to measure gas consumption.
92. The ..... is the unit used to measure water consumption.
93. One cubic foot of water contains ..... gallons.
94. In most towns the electrical, gas, and water meters are read each .....
95. The safest extension cord is the .... kind.
96. An electric extension cord insulated with asbestos is called a ....
97. An ..... knot should be tied at the end of each cord.
98. The ..... on machine belts should be released when not in use.
99. Never put ..... on a leather belt.
100. The ..... on a motor are the parts that require oil.
101. The ..... is the part of a motor that revolves.
102. Each house must be equipped with an entrance ..... and a ..... block.
103. A ..... is placed in the circuit for safety purposes only.
104. Always replace a blown fuse with one of the same .....
105. A blown fuse is usually caused by a .....
106. ..... is used to step voltage down.
107. The heating ..... furnishes the heat for the iron.
108. A rough and discolored iron will ..... more heat than will a clean smooth iron.
109. Some iron discolorations may be removed with ..... and .....
110. The ability to .... determines the efficiency of an electric iron.
111. The ..... element is placed in direct contact with the ..... of the iron.
112. When you finish ironing, disconnect the .... first and then pull the plug from the iron to prevent burning the points.
113. An ordinary iron requires about ..... watts.
114. Most vacuum cleaners have a motor connected directly to a .....
115. This connection creates a ..... under the nozzle.
116. A cleaner will work more efficiently with an ..... bag.
117. ..... should be used to lubricate the motor.
118. All electrical connections should be clean and .....
119. ....., ..., and ..... are the three essential parts of the electric range.
120. An electric range is usually equipped with ..... surface units.
121. ..... heat controls are provided on electric ovens.
122. The ..... is generally located in the top of the oven.
123. Which is the cheapest to operate, an electric or coal range .....
124. Which has the lowest original cost, the electric or gas range .....
125. To burn natural gas it must first be mixed with .....
126. Gas stoves will light automatically when a light is used.
127. B.T.U. means ....
128. The ..... of a gas flame gives the most heat.
129. The color of a correct gas flame is .....
130. Which stove is the most difficult to keep in working order, a gas or electric .....
131. The force of ..... carries waste materials to the sewers.
132. Sewerage systems are constructed and maintained by the .....
133. All sewers develop poisonous .....
134. To prevent this gas from leaking into the home ..... are provided.
135. These are filled with .....
136. The plumbers friend is a ....
137. A flexible steel used for cleaning pipes is called the ....
138. ..... are used to remove grease.
139. Stains on plumbing fixtures should be removed with ....
140. Alkali rings on fixtures may be removed with ..... and .....
141. If you do not have the opportunity to connect to a city sewer a ..... may be used.
142. Many hot-water systems are connected directly to the .....
143. The upright water tank usually holds from ..... to ..... gal.
144. The warm water will go to the ..... of the tank because it is ..... than cold water.
145. To protect against too much pressure in the tank the .... has been put into use.
146. Hot-water tanks should be ..... to prevent loss of heat.
147. The water temperature in the tank is controlled by a .....
148. Heating coils are usually made from .....
149. The ..... and ..... are the two most common kinds of faucets.
150. In the ..... type a washer is screwed down against the force of the water.
151. Most faucet leaks may be repaired by replacing the .....
152. A ..... wrench is used to turn water pipes.
153. A ..... and ..... solution should be used to test for gas leaks.
154. Temporary repairs on gas leaks may be made with .....
155. The kerosine lamp uses the principle of ..... attraction to make it light.
156. The kerosine is ..... by the heat of its own burning.
157. Both ..... and ..... gas is used extensively.
158. A mantle is used to burn ..... gas.
159. .... and water produce a gas satisfactory for lighting.
160. Within 50 years after the kerosine lamp was invented the ..... lamp was developed.
161. A metal heated to a high temperature, becomes ..... or white hot.
162. This type of lamp was developed by ..... in .....
163. Most modern light bulbs are ..... on the inside.
164. The most common lighting circuit voltage is ..... volts.
165. ....., ..., and ..... are the three general systems of lighting used in homes.
166. ....., ..., and ..... are the three classes of lighting fixtures used in homes.
167. Dust coats may cause ..... to ..... per cent loss of light.
168. Bathroom fixtures should be ..... against possibility of grounding through damp hands.
169. Having ..... conveniently located in the room will save electricity.
170. ..... are used to transport electricity.
171. ..... is the best material with which to insulate wire.
172. ..... and ..... are the two names for electrical pressure.
173. ..... discovered that an electric current could be caused to flow by the use of chemicals.
174. The plates of a storage battery are made of .....
175. ..... acid is used in a storage battery.
176. Storage-battery containers are made of .....
177. Are the cells of a storage battery wired in series or parallel? .....
178. How many wires must be connected to every piece of electrical apparatus? .....
179. How many wires are necessary to connect a bell, dry cell, and a switch? .....
180. A ..... is used to test a storage battery.
181. A ..... is used to provide voltage for a storage battery in an automobile.
182. A storage battery in a car should be inspected every .....
183. The ammeter on a car dash should read ..... when the motor is running.
184. There are ..... volts in a dry cell.
185. There are ..... volts in each cell of a storage battery.
186. There are ..... volts in a storage battery.
187. ..... and ..... are two methods used for connecting either lamps or cells.
188. Which method has been used if all lights go out when one bulb is broken.
189. Which will generate the most heat, an iron or copper wire? .....
190. Which will heat the most, a large or small wire? .....
191. ..... and ..... are the two types of fuses most generally used.
192. In homes, what size fuse plugs do we generally find in branch circuits? .....
193. There must be ..... conducting circuits between every light and the source of electricity.

Perfect Score is 193.

Key

1. top, front, side
2. three
3. squaring
4. try square
5. six
6. face
7. cutting board
8. thin
9. water
10. eyes
11. sand
12. toward
13. joints
14. clamp
15. rope
16. water
17. kerf
18. beautiful, durable
19. inside, outside
20. varnish
21. plastic wood, putty
22. lighter
23. wide, long
24. ¾
25. shellac
26. sanded
27. linseed oil
28. two, three
29. turpentine
30. ½
31. spar
32. enamel
33. wild boar
34. turpentine, cleaner
35. cheap
36. alcohol
37. wood filler
38. oil, water, spirit
39. oil
40. gimp
41. tied
42. moss or tow
43. hair
44. cotton
45. carbon tetrachloride
46. hand, electric
47. oak, maple
48. subfloor
49. shellac
50. two
51. wax
52. inlaid
53. inlaid
54. battleship
55. print
56. felt
57. varnish, wax
58. plastic wood
59. sand, lime
60. hair
61. lath
62. three
63. patching
64. of Paris
65. trowel
66. torn
67. copper, bronze
68. lacquer
69. half-lap
70. mortise and tennon
71. pine
72. two
73. cylinder, tumbler, warded
74. brass
75. No
76. lubricate
77. wax
78. warded
79. tumbler
80. two
81. inspected
82. insulation
83. open main switch
84. kilowatt
85. volt
86. ohm
87. watts, kilowatt
88. watts
89. watt-hour
90. motor
91. cubic ft.
92. gallon
93. 7½
94. month
95. rubber-covered
96. heater cord
97. underwriter's
98. tension
99. oil
100. bearings
101. armature
102. switch, fuse
103. fuse
104. rating
105. short circuit
106. transformer
107. healing
108. radiate
109. chalk
110. hold heat
111. heating, sole
112. wall plug
113. 600 watts
114. fan
115. vacuum
116. empty
117. light oil
118. tight
119. cooking top, oven, broiler
120. four
121. automatic
122. broiler
123. coal
124. gas
125. air
126. pilot
127. British Thermal Unit
128. top
129. blue
130. gas
131. gravity
132. city
133. gases
134. traps
135. water
136. rubber plunger
137. plumbers snake
138. solvents
139. washing powder
140. salt, vinegar
141. cess pool
142. furnace
143. 20, 50
144. top, lighter
145. automatic
146. insulated
147. thermostat
148. copper
149. Fuller, compression
150. compression
151. washer
152. pipe
153. soap and water
154. soap
155. capillary
156. vaporized
157. natural and artificial
158. natural
159. calcium carbide
160. incandescent
161. incandescent
162. Edison, 1879
163. frosted
164. 110
165. Direct, indirect, semi-indirect
166. wall brackets, ceiling lights, portable lamps
167. 15, 25
168. insulated
169. switches
170. conductors
171. rubber
172. voltage and electromotive force
173. Volta
174. lead
175. sulphuric
176. rubber
177. series
178. two
179. three
180. hydrometer
181. generator
182. week
183. charge
184. 1½
185. two
186. six
187. series and parallel
188. series
189. iron
190. small
191. cartridge, plug
192. 10 amperes
193. two

TEST FOR THE GENERAL METAL CLASS

Harold E. Robbins,
Northeast Jr. High School,
Kansas City, Kans.

The following test has been prepared to test the ability of students to do 18 outstanding jobs in the general metal shop. It may also be used as a basis for determining the special difficulties of individual pupils at any time.

The statements in each job have been arranged in such a manner that they are not in the order that they would occur in doing the job. The purpose being to rearrange the numbers to show the correct procedure.

In scoring the test two scores can be used, the point and the job score. The point score is made up of all the correct responses, one point for each correct response. The job score consists of the number of jobs which are completed without error.

No. 1. To Tin a Soldering Copper.

Procedure:

1. Rub on sal-ammoniac block with solder until tinned.
2. File to shape while hot.
3. Heat the soldering copper.
4. Dip copper in dipping solution and brighten.

( ), ( ), ( ), ( ).

No. 2. To Rivet Two Pieces of Mild Steel Together with Soft Iron Rivets.

Procedure:

1. Select size of rivets.
2. Drill holes on the drill press.
3. Center punch pieces of mild steel to be riveted together.
4. Select size of drill.
5. Drive the rivets in place.
6. Rivet the pieces together.

( ), ( ), ( ), ( ), ( ), ( ).

No. 3. To Make Out a Job Plan.

Procedure:

1. Name tools needed for making a special project.
2. Name size and number of pieces of material needed for project.
3. Write out procedure.
4. Fill out information at top of sheet.

( ), ( ), ( ), ( ).

No. 4. To Rivet Two Pieces of Galvanized Iron Together with Metallic Rivets.

Procedure:

1. Place the hole in the end of rivet set over the print and hammer until rivet cuts through the metal.
2. Place the cup in the end of rivet set over the rivet and rivet the pieces together.
3. Stand metallic rivet with head down on the edge of a hollow mandrel stake.
4. Place pieces of galvanized iron over rivet such that center-punched hole is exactly over rivet.
5. Arrange pieces of galvanized iron in position and center punch.
6. Hit the galvanized iron with a mallet until the print of the rivet shows.

( ), ( ), ( ), ( ), ( ).

No. 5. To Solder a Lap Joint.

Procedure:

1. Clean off any excess solder.
2. Arrange pieces of metal in correct position.
3. Solder the joint until the solder flows freely into the joint.
4. Tack pieces of metal in position.
5. Test the joint for strength.

( ), ( ), ( ), ( ), ( ).

No. 6. To Sweat a Lap Joint.

Procedure:

1. Heat metal until solder flows.
2. Test the strength of the joint.
3. Clean off excess solder.
4. Tin edges to be sweated.
5. Place metal in position over fire.
6. Paint edges of metal with flux.

( ), ( ), ( ), ( ), ( ), ( ).

No. 7. To Make a Lock-Seam Joint.

Procedure:

1. Lay out width of hems and clip corners at an angle.
2. Cut pieces of metal to necessary size.
3. Lock pieces of metal together.
4. Set joint with a hand-grooving tool.
5. Fold hems in the bar folder.
6. Tap joint lightly with a wood mallet.

( ), ( ), ( ), ( ), ( ), ( ).

No. 8. To Punch Holes with Hollow Punch.

Procedure:

1. Draw circle the size of the hole with wing dividers.
2. Straighten out metal and file off burrs.
3. Select size of hollow punch to correspond with circle.
4. Locate center for hole.
5. Place metal on lead cake.
6. Place cutting edge of hollow punch on circle and hammer until hole is through the metal.

( ), ( ), ( ), ( ), ( ), ( ).

No. 9. To Wire Edge of Funnel on the Wiring Machine.

Procedure:

1. Form wire into circle on the forming machine.
2. Set metal down around the wire on the wiring machine.
3. Select correct size of wire.
4. Cut to correct length.
5. Place wire in slot and bend metal down with pliers to hold wire in place.
6. Turn top edge of funnel on turning machine to receive wire.

( ), ( ), ( ), ( ), ( ), ( ).

No. 10. To Wire Edges with Bar Folder and Hammer.

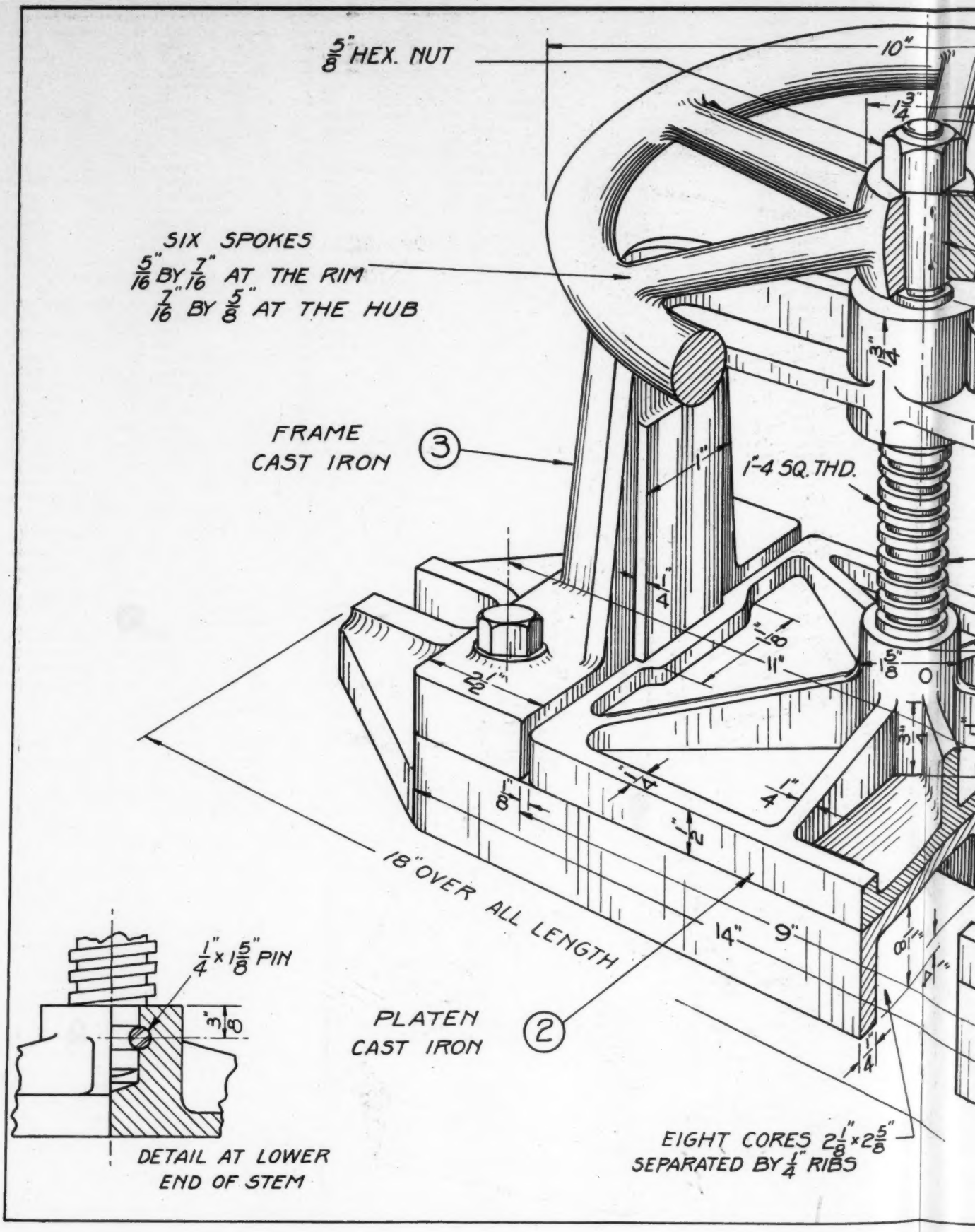
Procedure:

1. Set metal down close around the wire with setting hammer.
2. Place wire in hem.
3. Determine width of hem needed and fold on the bar folder.
4. Cut off to correct length.
5. Bend the metal down with pliers to hold the wire in place.
6. Straighten wire with mallet.
7. Select size of wire needed.

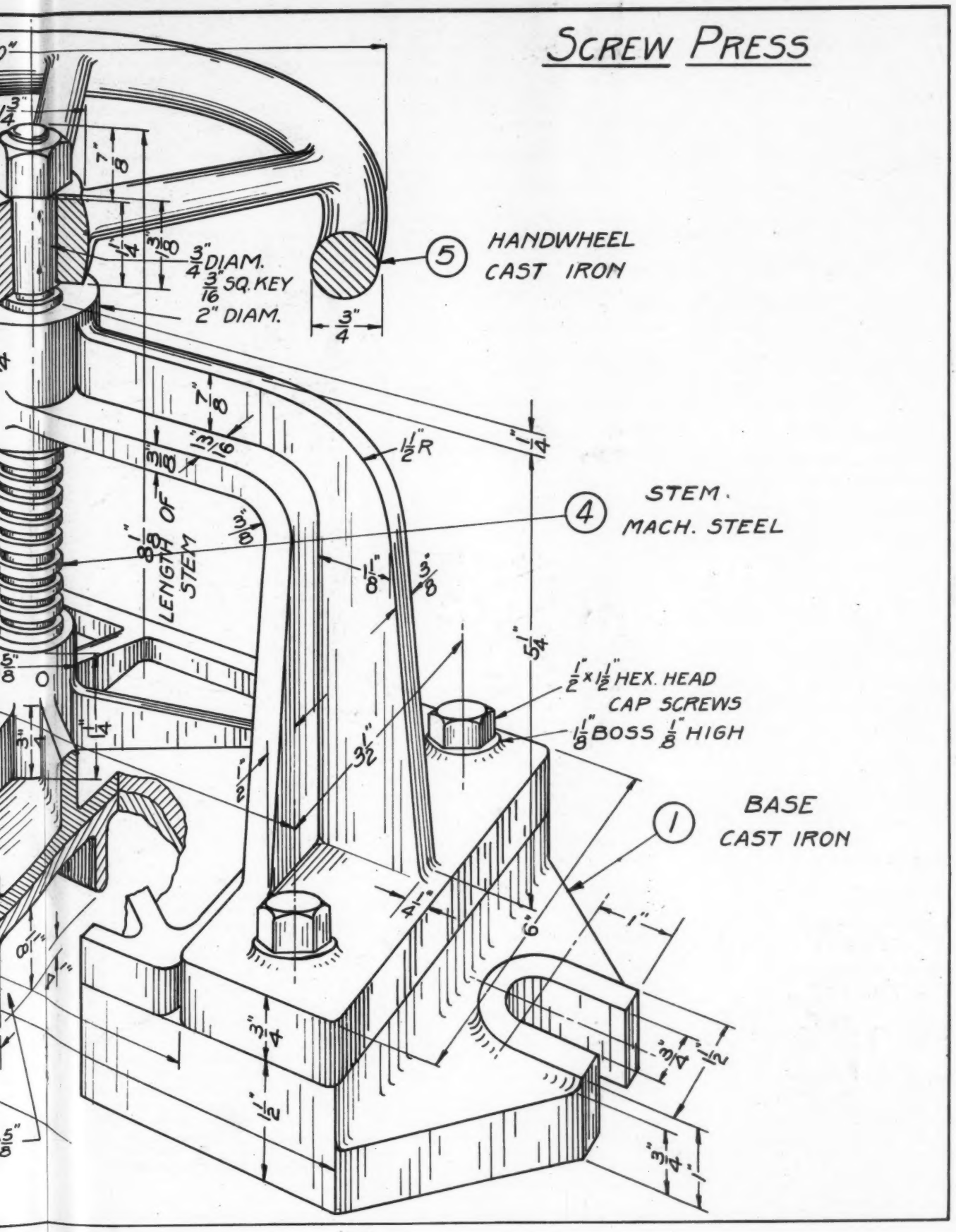
( ), ( ), ( ), ( ), ( ), ( ), ( ).

No. 11. To Drill Holes in Metal Using the Drill Press.

(Continued on page 67)



Screw Press, by W. A. De Vette, Technical



De Vette, Technical High School, Erie, Pa.

(Continued from page 62)

Procedure:

1. Start the motor and pull down the drill-press handle until drill touches center-punched point.
2. Place drill in the drill press.
3. Select size of drill.
4. Remove burrs from the bottom of the hole with file.
5. Pull steadily down on the drill-press handle so that the drill cuts an even shaving.
6. Drill through metal.

( ), ( ), ( ), ( ), ( ), ( ).

No. 12. To Color Copper or Brass.

Procedure:

1. Remove from water and let dry.
2. Place project in the solution and leave until desired color is obtained.
3. Put piece of liver of sulphur about the size of a walnut in the water and dissolve.
4. Heat water until lukewarm.
5. Fill vessel with enough water to cover the project.
6. Select vessel to hold the project.

( ), ( ), ( ), ( ), ( ), ( ).

No. 13. To Etch on Copper or Brass.

Procedure:

1. Prepare etching solution.
2. Transfer pattern onto metal.
3. Paint with black asphaltum the part not to be etched and the back if necessary.
4. Take metal out of solution and rinse in clear water.
5. Place in etching solution and leave for approximately 45 minutes.
6. Clean off asphaltum with pure turpentine.

( ), ( ), ( ), ( ), ( ), ( ).

No. 14. To Cut a Right-Hand Thread on a Pipe.

Procedure:

1. Oil portion to be threaded.
2. Select correct size of die.
3. Push the die onto the pipe, and turn in a clockwise direction until thread of proper length has been cut.
4. Remove the die and test the thread.
5. Slip die on the pipe.

( ), ( ), ( ), ( ), ( ).

No. 15. To Give a Durable Black Finish to Mild Steel.

Procedure:

1. Keep the steel moving over a flame, until correct shade of black is received.
2. In case it doesn't burn the first time place more linseed oil on the steel and burn again.
3. Place the steel over the flame.
4. Allow it to cool in the air.
5. Rub the steel with linseed oil.

( ), ( ), ( ), ( ), ( ).

No. 16. To Start a Metal Spinning Job.

Procedure:

1. Cut metal disk to correct size.
2. Start machine and center the disk.
3. With roundnose tool set metal close enough to wood chuck so that it will hold itself in the machine.
4. Place disk in the machine between the wood chuck and follow up block.
5. Set tail stock so that the machine runs freely.

( ), ( ), ( ), ( ), ( ).

No. 17. To Twist Iron Bars for Ornamental Effect.

Procedure:

1. Place a monkey wrench even with the other mark on the iron bar.
2. Twist, making the necessary turns.
3. Place one mark on the iron bar even with the side of the vice.
4. Mark off section to be twisted.
5. Slip a pipe over the section to be twisted.

( ), ( ), ( ), ( ), ( ).

No. 18. To Make a Sand Mold.

Procedure:

1. Lift cope off and remove pattern.
2. Cut gate opening.
3. Sprinkle the surface of the sand in the drag with parting sand.
4. Place drag side of flask in position over pattern.
5. Put sprue pin in position.
6. Place the cope back on the drag carefully.
7. Place the pattern cope side down on the molding board.
8. Place cope in position on top of the drag.
9. Ram cope full of sand and strike off extra sand.
10. Ram the drag full of sand and strike off extra sand.
11. Loosen and remove sprue pin.
12. Roll the drag and molding board over.

( ), ( ), ( ), ( ), ( ), ( ),
( ), ( ), ( ), ( ), ( ), ( ).

Key

No. 1.	3, 2, 1, 4.	No. 10.	7, 4, 6, 3, 2, 5, 1.
No. 2.	3, 4, 2, 1, 5, 6.	No. 11.	3, 2, 1, 5, 6, 4.
No. 3.	4, 1, 2, 3.	No. 12.	6, 5, 4, 3, 2, 1.
No. 4.	5, 3, 4, 6, 1, 2.	No. 13.	2, 3, 1, 5, 4, 6.
No. 5.	2, 4, 3, 1, 5.	No. 14.	2, 5, 1, 3, 4.
No. 6.	4, 6, 5, 1, 2, 3.	No. 15.	5, 3, 1, 2, 4.
No. 7.	2, 1, 5, 3, 6, 4.	No. 16.	1, 4, 2, 5, 3.
No. 8.	4, 1, 5, 3, 6, 2.	No. 17.	4, 3, 5, 1, 2.
No. 9.	3, 4, 1, 6, 5, 2.	No. 18.	7, 4, 10, 12, 3, 8, 5, 9, 11, 1, 2, 6.

TEST FOR THE PRINT SHOP

E. V. Ahonen,
Junior High School,
Chisholm, Minn.

Tools and Equipment

Below will be found a series of incomplete statements. In the blanks provided for the purpose, write the word or words that complete the statement.

1. A three-sided metal tray used for storing type and the make-up of pages is called a .....
2. A three-sided metal tool with one adjustable side used for assembling type is called a .....
3. The roller used for inking a type form is called the ....
4. Proofs are taken on a ....
5. The printer's measuring stick is called a ....
6. Our body type is kept in .... cases.
7. When setting solid we use, in place of leads, a ....
8. Strips of type metal less than type high and from one to three points thick used for space between lines are called .....
9. Strips of type metal less than type high and from 4 to 6 points thick, used for horizontal spacing are called .....
10. Strips of wood ½ pica and 1 pica thick, less than type high and used for horizontal spacing are called .....
11. Pages are made up and forms are locked up on an ....

MID-TERM TEST FOR INDUSTRIAL-ARTS WOODWORKING CLASSES

James F. Ahlbach,
State School For Boys,
Jamesburg, N. J.

This is a woodworking test for students of industrial arts, and consists of 5 different types of questions; namely, true and false, sentence completion, multiple choice, yes—no, and matching. It should be given to the students at the end of a semester's work after the teacher has given the pupils a number of other short tests. In so doing, the teacher will ascertain how much the students really have learned in the industrial-arts woodworking course.

In grading, the highest possible score any one pupil can obtain is 100. For each correct response, one point of credit is given. Two points of credit are deducted for each incorrect response of all true and false and yes—no questions. No credit is given or deducted for questions unanswered. Each test is accompanied by a "scoring key."

The Test

	Score
Part 1. True-and-False Questions...	.....
Part 2. Sentence-Completion Questions	.....
Part 3. Multiple-Choice Questions..	.....
Part 4. Yes—No Questions	.....
Part 5. Matching (Tools & Names) Questions	.....
Total Score	.....

Student's Name .....
Grade..... Age.....
Name of School..... Date.....

Part 1. True-and-False Questions Scoring Key

Directions: The letters *T* and *F* precede each of the following statements. Encircle the letter *T* if you think the statement is true. Encircle the letter *F* if you think the statement is false. *Do not guess.* If you are unable to decide whether a statement is true or false, leave it alone. You will be penalized for each statement incorrectly marked by a deduction of *two* points of credit from the number of correctly marked statements. Notice the sample statement.

Sample: (T) F Auger bits are numbered in sixteenths of an inch.

1. T F It is easier to plane with the grain of the wood than against it.
2. T F The old-fashioned wooden plane bed is as efficient as the steel bed plane.
3. T F The block plane is the smallest plane used in the school shop.
4. T F The shape of the teeth of the ripsaw is identical with the shape of the teeth of the crosscut saw.
5. T F The ripsaw is used to saw across the grain of the wood.
6. T F The expansive bit can be used to bore several sizes of holes.
7. T F The ratchet device is used to adjust the brace when you cannot get a full turn on the brace.
8. T F Joints should always be sanded so the glue can penetrate more easily.
9. T F Before marking with a marking gauge, the distance from the spur to the head should be tested with a ruler.

10. T F The dovetailed joint is identical with the butt joint.
11. T F All parts of a project should be properly fitted before assembling.
12. T F Glue on the surface of the wood prevents stain from penetrating.
13. T F Sandpaper should not be used until all edge tool work is completed.
14. T F A chisel may be used as a screw driver.
15. T F Shellac is thinned with turpentine.
16. T F There are two board feet in a piece of 1 by 12 by 24-in. lumber.
17. T F Drawings need not be accurate to produce the best results.
18. T F Yellow poplar is a hard wood.
19. T F Oak is a closed-grain wood.
20. T F Wood filler is never rubbed after applying.
21. T F A No. 8 wood screw is smaller in diameter than a No. 14.
22. T F There are 4 board feet in a piece of 1 by 12 by 48-in. lumber.
23. T F A bevel and a chamfer are the same.
24. T F A plane should be placed on its side when not in use.
25. T F A pilot hole is made for the unthreaded part of a screw.

Right..... Omitted.....
Wrong..... Score.....

Scoring Key

1. T	6. T	11. T	16. T	21. T
2. F	7. T	12. T	17. F	22. T
3. T	8. F	13. T	18. T	23. F
4. F	9. T	14. F	19. F	24. T
5. F	10. F	15. F	20. F	25. T

Part 2. Sentence-Completion Questions

Directions: The following statements are incomplete, one word having been omitted. You are to fill the blank space with the proper word that will make the sentence a true statement. Notice the sample statement.

Sample: A crosscut saw is used to saw across the grain of the wood.

1. ..... hammers are used to draw nails out of wood if the nails protrude far enough to get a hold on it.
2. The ..... is used to gauge width and thickness.
3. Miter ..... should be cut in a miter box.
4. Sanding should always be done ..... the grain of the wood.
5. The letters ..... mean that two sides of the board are to be surfaced.
6. Oil and paint ..... should never be left in a heap because of the danger of spontaneous combustion.
7. A piece of lumber ¾ by 12 by 12 in. would be figured as ..... board foot.
8. ..... is used in finishing a project because it brings out the beauty of the grain.
9. When using ..... head screws, all holes must be countersunk.
10. A project is always finished with No. 3/0 .....

Score: Right.....

Scoring Key

1. Claw	6. rags
2. gauge	7. 1
3. joints	8. Stain
4. with	9. flat
5. S2S	10. sandpaper

Part 3. Multiple-Choice Questions

Directions: In each of the following sentences underline the word in parentheses that makes the best meaning. Then place the number of the underlined word in the brackets at the left of each question.

Example: (3) A woodworker drives nails with a (1. mallet) (2. mall) (3. hammer).

1. ( ) The hole for a (1. roundhead) (2. flathead) (3. oval-head) type of screw is always countersunk.
2. ( ) An auger bit for boring a ½-in. hole is number (1. four) (2. eight) (3. twelve) (4. sixteen).
3. ( ) The term *F. H. B.* refers to (1. screws) (2. nails) (3. auger bits).
4. ( ) When the head of the screw is to be left level with or a little below the surface, you should use a (1. oval-head) (2. roundhead) (3. flathead) screw.
5. ( ) The abbreviation S2S in woodworking means (1. sand 2 surfaces) (2. square 2 sides) (3. surface 2 sides).
6. ( ) The (1. thickness) (2. width) (3. length) of lumber runs the same way as the grain.
7. ( ) The most common fasteners in woodwork are (1. hinges) (2. corrugated fasteners) (3. screws).
8. ( ) In making a mortise-and-tenon joint it is best to make the (1. tenon) (2. mortise) (3. mortise and tenon) first.
9. ( ) The fit of the mortise and tenon should be (1. loose) (2. tight) (3. close).
10. ( ) The proper method to use in ordering lumber is (1. width by length by thickness) (2. length by width by thickness) (3. thickness by width by length).
11. ( ) How is walnut wood classified in regards to weight? (1. Light) (2. Medium) (3. Heavy).
12. ( ) A piece of stock 3 by 3 by 30 in. contains (1. 2¼ board feet) (2. ⅝ board feet) (3. 1⅞ board feet).
13. ( ) Which of the following saws has the finest teeth? (1. Back) (2. Turning) (3. Dovetail) (4. Crosscut).
14. ( ) Which of the following planes does not have a cap iron? (1. Joiner) (2. Jack) (3. Smooth) (4. Block).
15. ( ) Which of these planes would be best to use for smoothing the edges of a rocker for a chair? (1. Universal) (2. Smooth) (3. Spokeshave) (4. Router).

Score: Right.....

Scoring Key

1. 2	5. 3	9. 2	13. 3
2. 2	6. 3	10. 3	14. 4
3. 1	7. 3	11. 2	15. 3
4. 3	8. 1	12. 3	

Part 4. Yes—No Questions

Directions: A number of questions follow, some of which should be answered by *Yes*, others by *No*. Underline the word Yes if you think it should be answered *Yes*. Underline the word No if you think it should be answered *No*. Do not guess. If you are unable to decide whether a question should be marked Yes or No, leave it alone. You will be penalized for each question incorrectly marked by a deduction of *two* points of credit from the number of correctly marked questions. Notice the sample question.

Sample: Yes—No. Are auger bits numbered in sixteenths of an inch?

1. Yes—No. Is the working face of a board prepared last?
2. Yes—No. Does soap make wood screws go into the wood more easily?
3. Yes—No. Are 12/16 in. and ¾ in. equal in length?
4. Yes—No. Is a countersink used for roundhead screws?
5. Yes—No. Should the working edge be prepared before the working face?
6. Yes—No. Is the mortise-and-tenon joint used much in furniture construction?
7. Yes—No. Is a simple butt joint the same as a dado-and-butt joint?
8. Yes—No. In making a mortise-and-tenon joint is it good practice to fit the tenon occasionally when chiseling to size?
9. Yes—No. Is it best to saw slowly when sawing curved lines on a band saw?
10. Yes—No. Should the wood screws for fastening cross grain be longer than those for end grain?
11. Yes—No. Do woods that have a pronounced grain usually require a paste filler?
12. Yes—No. Is the word *bird's-eye* used to describe certain types of oakwood?
13. Yes—No. If a scale of ¼ in. equals 1 in. is used to make a drawing, are the full-sized dimensions placed on the drawing?
14. Yes—No. Should the rule ever be placed on its edge when measuring stock?
15. Yes—No. Is it advisable to use the jointer plane for planing end grain?
16. Yes—No. Does the 12-point saw cut smoother than the 6-point saw?
17. Yes—No. When sawing heavy stock with the hand saw, are short strokes better than long ones?
18. Yes—No. Should a shorter bevel be ground on a plane iron for planing softwood than for planing hardwood?
19. Yes—No. Is the best broad surface of stock selected as the working face?
20. Yes—No. Is the beam of the marking gauge placed against the working face when marking stock to thickness?

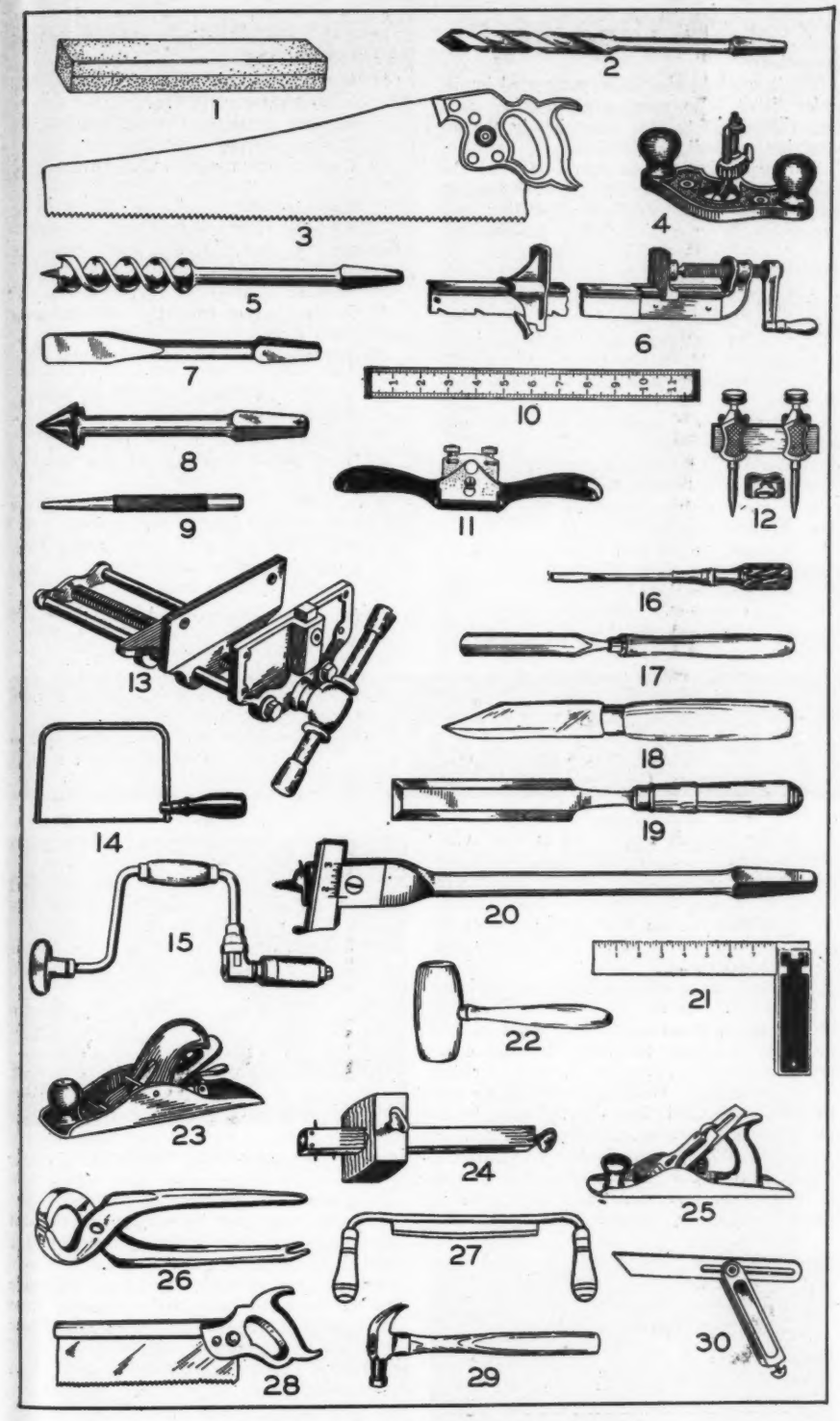
Right..... Omitted.....
Wrong..... Score.....

Scoring Key

1. No	5. No	9. Yes	13. Yes	17. No
2. Yes	6. Yes	10. No	14. Yes	18. No
3. Yes	7. No	11. No	15. No	19. Yes
4. No	8. Yes	12. No	16. Yes	20. No

Part 5. Matching Test (Tools and Names)

Directions: Give the names of the tools shown in the illustration. Be as definite as you possibly can. If there is a picture of a saw, plane, or knife, tell what kind of a saw, plane, or knife it is.



Illustrations of tools to go with Part 5 of test

1.	12.	23.	27. .....
2.	13.	24.	28. .....
3.	14.	25.	29. .....
4.	15.	26.	30. .....
5.	16.	*Score:*	Right.....
6.	17.		
7.	18.		
8.	19.		
9.	20.		
10.	21.		
11.	22.		

Scoring Key

1. Oil stone
2. Wood-boring brace bit
3. Ripsaw
4. Router plane
5. Auger bit
6. Bar clamp
7. Screw-driver bit
8. Countersink
9. Nail set
10. Rule
11. Spokeshave
12. Trammel points
13. Vise
14. Coping saw
15. Brace
16. Screw driver
17. Turning gauge
18. Sloyd knife
19. Paring chisel
20. Expansion bit
21. Try square
22. Mallet
23. Block plane
24. Marking gauge
25. Jack plane
26. Pincers
27. Drawknife
28. Back saw
29. Claw hammer
30. T bevel

TYPICAL JOB SHEETS— AUTO MECHANICS No. 1

F. B. Miller,
Central High School,
Tulsa, Okla.

Job Sheet No. 1
Basic Tools and Shop Processes

Directions:

The items listed on this sheet may be performed in any order most convenient to you but they must all be completed before starting any other job. The *number* given after each step refers you to the instruction manual for directions.

The foreman and instructor are ready to answer questions but be sure you have read your instruction manual first.

Procedure:

1. Learn the location of equipment and materials. No. 1.
2. Learn the identity and use of common shop tools. No. 2.
3. Learn the correct methods of basic tool processes. No. 3.
4. Learn the correct procedure of shop order and shop cleaning. No. 4.
5. Learn the sizes and kinds of hardware and other supplies. No. 5.

Job Sheet No. 2
Motor Parts and Theories

Directions:

The items listed on this sheet may be performed in any order most convenient to you but they must all be completed before starting any other job. The *number* given after each step refers you to the instruction manual for directions.

The foreman and instructor are ready to answer questions but be sure you have read your instruction manual first.

Procedure:

1. Identification of motor parts. No. 51.
2. Materials used in motor parts. No. 52.
3. Explanation of piston and valve action. No. 75.
4. Diagrams of four-cycle engines. No. 76.
5. Motor parts numbering systems. No. 111.

Job Sheet No. 5
Motor No. 5 (6 Cylinders)

Directions:

The operations should be performed in the order listed. The *number* given after each step refers you to that operation in the instruction manual for directions.

Start each day on the operation after the one last recorded in the previous period. Record completed operations by writing your period No. in front of each step you finished.

Procedure:

1. Remove carburetor and then manifolds. No. 102.
2. Remove ignition conduit. No. 301.
3. Remove and clean spark plugs. No. 100.
4. Remove and clean cylinder head. No. 101.

5. Remove and clean oil pan. No. 117.
6. Remove and clean valves. No. 104.
7. Clean block. No. 108.
8. Lap in valves. No. 110.
9. Replace valves. No. 113.
10. Adjust valve clearance, and *get instructor's O.K.* No. 115. .....
11. Check rod bearing fit and cottering, and *get instructor's O.K.* to replace pan. .....
12. Replace oil pan. No. 117.
13. Replace cylinder head and ignition conduit. No. 101.
14. Replace spark plugs. No. 100.
15. Replace gaskets and manifolds. No. 102.
16. Replace carburetor.

Note: The following steps are to be done during the *single* period by each group (in each class) assigned to this motor, and must be repeated each day until the motor is run.

17. Check and adjust distributor points. No. 302.
18. Find firing order. No. 77.
19. Time ignition. No. 304.
20. Wire ignition circuit. No. 351, and *get instructor's O.K.* .....
21. Attach cables to battery and starter, and test connections. Nos. 225, 226, and 252.
22. Run motor. No. 352.

Note: Have you recorded operations you completed today?

Job Sheet No. 8
Motor No. 8 (8 Cylinders)

Directions:

The operations should be performed in the order listed. The *number* given after each step refers you to that operation in the instruction manual for directions.

Start each day on the operation after the one last recorded in the previous period. Record completed operations by writing your *period* No. in front of each step you finished.

Procedure:

1. Remove manifolds. No. 102.
2. Remove distributor. No. 301.
3. Remove cylinder head. No. 101.
4. Remove valves. No. 104.
5. Remove valve lifter clusters and springs. No. 104.
6. Invert motor crossways on stand *with instructor's help.*
7. Remove and clean oil pan. No. 117.
8. Remove oil pump. No. 151.
9. Remove piston assemblies. No. 118.
10. Remove flywheel. No. 125.
11. Remove timing gear cover. No. 124.
12. Remove camshaft. No. 124.
13. Remove crankshaft. No. 122.
14. Clean block. No. 108.
15. Clean bearings and replace crankshaft. No. 122.
16. Adjust main bearings and *get instructor's O.K.* No. 123. .....
17. Replace camshaft, and time valves. No. 124. *Get instructor's O.K.* .....
18. Replace timing gear cover. No. 124.
19. Replace rear flywheel. No. 125.
20. Clean piston assemblies and rings. No. 119.
21. Replace piston assemblies. No. 120.
22. Fit connecting rod bearings, and *get instructor's O.K.* No. 121. .....
23. Clean and replace oil pump. No. 151.
24. Replace oil pan. No. 117.
25. Replace motor correctly on stand *with instructor's help.*
26. Replace valve lifters and valves. No. 113.
27. Adjust valve clearance, and *get instructor's O.K.* No. 115. .....
28. Replace manifolds. No. 102.
29. Find piston displacement and *hand in report.* No. 84.

Note: This report must contain the measurements and figuring used in finding displacements, and is due *in every period from each group* assigned to this motor.

30. Replace cylinder head. No. 100.

Note: Have you recorded operations you completed today?

Problems and Projects

SCREW PRESS

W. A. DeVette,
Technical High School, Erie, Pa.

(For drawing, see pages 64 and 65.)

The screw press, shown in this unit drafting problem, appeared in this magazine a number of years ago as an assembly drawing with only a very few over-all dimensions. To guide a student far enough along in drafting into assuming the responsibility for selecting the thickness of metal and proportions of the various parts was the aim of the problem.

However, it is too good a problem to save for a place in the drafting course which many students do not reach. The four castings may be made to cover almost the entire subject of sectional views.

The problem may be used to illustrate half and quarter sections, broken sections, square and national threads. It may also be used to show the treatment in section of ribs, spokes, keys, and pins. The base casting gives an opportunity for the use of a staggered section. It is also a very good problem for the illustration of the use of finish and tolerances.

Thus it will readily be seen that the problem is well suited to the first semester for drafting trade students and second semester of related drafting for patternmakers and machinists. It also can be used in industrial-arts courses as a problem in detail and assembly scale drawings.

VULCANIZED LATEX CASTS IN PLASTER MOLDS

Julian Silver,
New York, N. Y.

A casting plastic that is light, unbreakable, and that can be handled without equipment has finally been developed and is now available to the home craftsman.

If you make puppets, whittle figures, or model in plasteline and want to make a number of copies of your work, you need not be limited to breakable plaster or the slow and messy papier-mâché.

This new prevulcanized liquid casting latex is poured in a plaster of Paris mold of the object to be reproduced. The walls of the mold absorbs the water from the latex compound and forms a crust on the mold surface. When the crust is as thick as desired the free solution is drained. The degree of thickness of the crust deposited on the plaster mold as well as the resulting cast is determined by the length of time the latex compound is allowed to remain in the mold. After the mold is drained absorption by the plaster mold continues, now however there is additional drying of the latex crust by evaporation through the hollow cast. As the drying continues the crust hardens and separates itself from the mold. At this point the latex cast is flexible but has sufficient body to be removed from the mold. The cast is then allowed to dry thoroughly by exposure to air.

Fig. 1. Plasteline model of mask

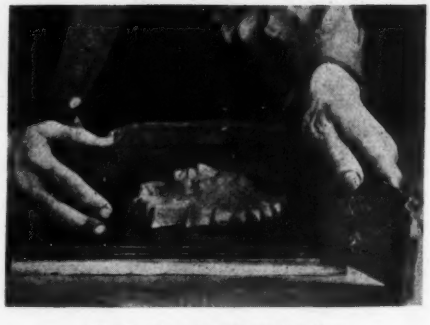


Fig. 2. Forming plasteline box

The dried cast is a light unbreakable hard vulcanized rubber. The vulcanizing ingredients are incorporated in the latex solution and upon drying turns into hard vulcanized rubber. As many as 25 good casts can be made from one plaster mold.

All that is needed to successfully make rubber casts is a good plaster mold of the object to be reproduced. Some objects such as masks or plaques can be made in one-piece molds. Round objects such as puppet heads, and figures, require molds of one or more pieces. A description of the method of making one- and two-piece molds follows:

The original plasteline modeling of the mask shown in Figure 1 is boxed with a

Fig. 3. Removing plaster mold from model

plasteline strip, cut long enough to give a 1-in. margin and wide enough to reach ½ in. higher than the model itself. See Figure 2. A sufficient amount of water to approximately fill the boxing is placed in a mixing bowl and plaster of Paris sifted into the water until small islands of plaster appear on the surface of the water. The plaster mixture is allowed to stand five minutes and then stirred until a smooth even mix is secured. Half of the plaster mixture is now poured over the model

Fig. 4. Showing latext casts in and out of mold

and then drained back in the bowl. With a soft brush a film of plaster is spread over the model. When the entire surface of the model has a thin film of plaster free of air bubbles the whole boxing is filled by pouring the plaster from one corner. Care must be taken not to trap air bubbles on the surface of the model.

When the plaster is set hard the plasteline boxing is removed and the plaster mold lifted from the model, as shown in Figure 3.

Fig. 5. Plasteline puppet head model separated by flange

No preparation of the plaster mold other than a thorough drying is needed for latex casting.

Prevulcanized latex prepared specially for casting is ready for use and needs only to be well mixed before pouring into the mold. Additional solution is added as the mold

Fig. 6. Preparing plaster flange for second part of mold

Fig. 7. Two piece plaster mold from plasteline model

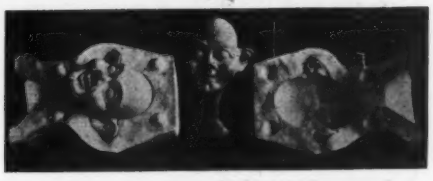


Fig. 8. Latex casts from two piece plaster mold

Fig. 9. Completed puppet

lowers the level of latex by absorption. After 10 to 15 minutes the free solution is drained. After approximately 1 hour the latex crust will he hard enough to be removed from the mold. See Figure 4. By allowing the mold to dry well between each casting more good casts can be made from the same mold.

To make a two-piece mold, the model is separated with a plasteline flange at the point where the mold is to divide, as shown in Figure 5. Care must be taken that neither half of the mold has any undercuts. Where this is not possible the mold must be made in as many pieces as needed to free the undercuts. When the model indicates a two-piece mold, the flange must be placed at the widest part extending around the model. With the flange in position, plaster is applied against the model and flange and built up to a thickness of at least 1 in. After the plaster has set, the plasteline flange is removed. This will expose the plaster flange that was cast against the plasteline strip.

Guide marks are scooped in a few convenient places on the plaster flange with the tip of a spoon. This flange is then painted with a strong soap solution. See Figure 6. When the soap solution is well absorbed into the plaster the flange is painted with oil, and plaster is then applied on the second half of the model and extended to the prepared plaster flange.

If the plaster flange was properly soaped and oiled the mold will separate without any difficulty as shown in Figure 7.

The mold is then dried well and latex casting compound cast as previously explained. The finished casting is shown in Figure 8.

When thoroughly dry, the seams of the cast can be sandpapered. Oil colors can be painted directly on the rubber cast. Hair on puppet heads can be cemented with thickened shellac.

SCOTTY BOOK ENDS

L. B. Rosenberg,
Metropolitan High School,
Los Angeles, Calif.

The Metropolitan High School is the continuation high school for the city of Los Angeles. Consequently, all types of boys come into the shop, some coming from other schools in the city, some from other cities in California, and some from out of the state. Their training in shopwork is naturally quite varied. Many have had no shop experience while others have had several years.

If the boy elects to take woodshop I have him start by making this little dog book end. It is a hand exercise and gives a check on the boy, what he has done and what he can do. His interest must be obtained during his first day in the shop. Boys like to make things and this project gives them the opportunity to do so at the outset. To eliminate cost of materials, which is a large item in a school of this type,

Scotty book ends

scrap materials are used in this project, either old crates or "shorts" left from larger projects.

First, the boy is required to square up a block of wood to 4 in. in width. This immediately acts as a check on his ability to do handwork. Many who claim several years experience in woodwork have difficulty in squaring, so this gives a review for them. From this piece of wood, the base and back of the book ends are made. The two outer corners of the base are cut off at 45 deg. The roof overhangs ⅛ in. and is made of lumber ⅛ in. thick. Lines are scribed on the front and back of the house to represent boards. A nail set is used to put in marks representing nailheads. These various points are clearly shown in the picture. A tin template is used to trace the outline of the dog. This seems to work very satisfactorily. The base is screwed to the uprights, the roof nailed and glued, and the dog nailed on. Finish with stain and shellac.

This project is not original with me, although I have used it for three years. I believe that this little project covers several beginning woodworking operations while, at the same time, the student himself feels that he is making something worth while.

EFFICIENT INEXPENSIVE FOUNDRY FURNACE

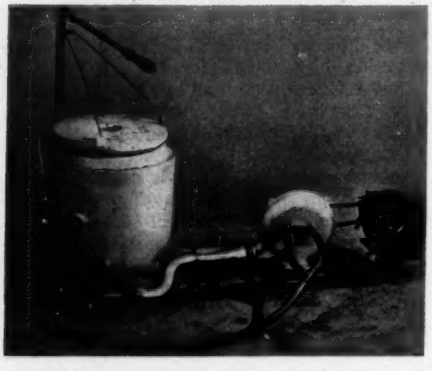
Michael F. Blawat,
Silver Creek Public School,
Silver Creek, N. Y.

Many shops are without foundry work because their budgets will not stand the cost of a furnace. A most satisfactory and inexpensive melting furnace was built by the writer's students, at a cost of $18.

The shell is half of a gasoline drum.

Lining and cover took 200 lb. of mullite.

The blower came from a blacksmith forge.



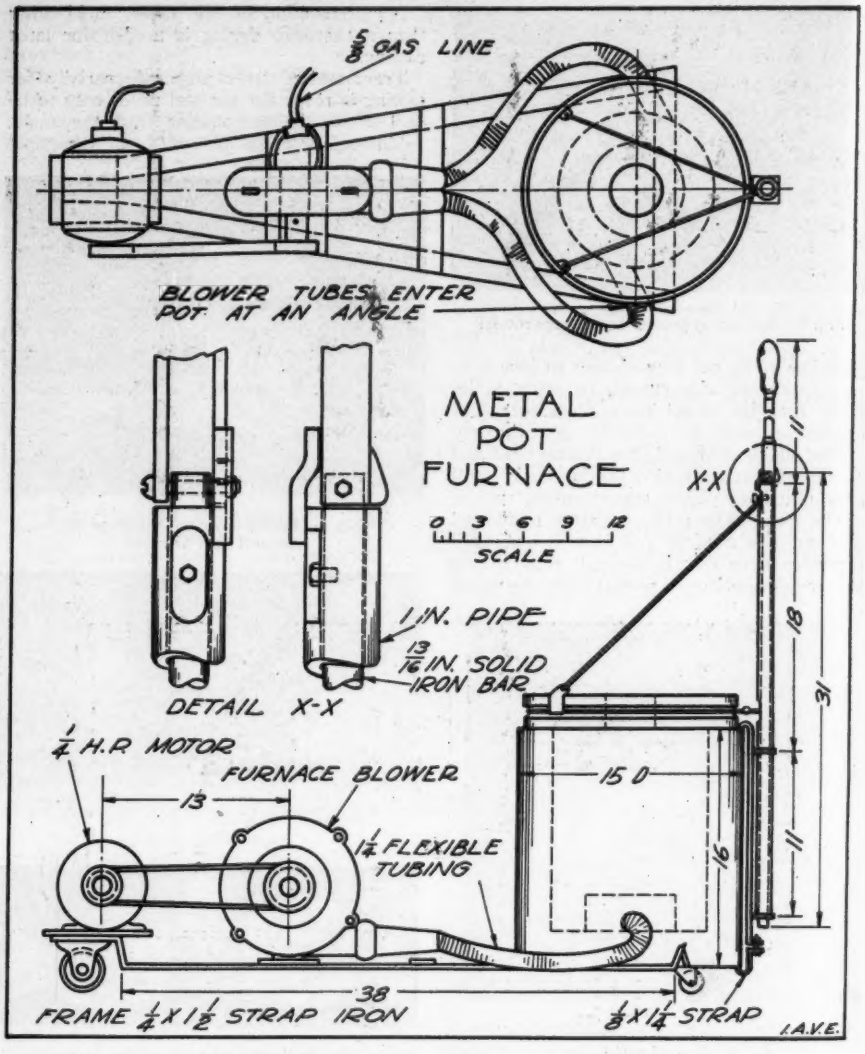
Flexible metal hose (1½ in.) is used from blower to pot.

⅝-in. gas line delivers natural gas.

¼ h.p. motor operates the blower.

A No. 10 crucible is used.

The furnace has been found to melt lead in 5 min., aluminum in 9 min., brass in 20 min. Glass has also been melted in it.



GRADING CARD FOR MECHANICAL DRAWING

Floyd E. Byron,
South Intermediate School,
Saginaw, Mich.

The 5 by 7-in. grading card shown herewith was devised to be used with McGee and Sturtevant's "General Mechanical Drawing."* According to the authors of this book, the instructor should divide each of his classes into three ability groups.

Each of the lessons also is divided into three parts, *C*, *B*, and *A*. The slowest group of students will be assigned the *C* problems, and will receive their grades on the card in the square under the letter *C*, in each lesson. The middle group will be assigned to *B* problems and their grades will be recorded in the squares under the letter *B* in each lesson. The advanced group will be assigned the *A* problems, and their grades will be recorded in the squares under the letter *A*.

Instructors who want to keep the entire class as a group may assign the *C*, *B*, and *A*, problems to each of the students, and place the grades earned in the squares under each of the letters.

Figure 14, referred to between lessons 4 and 5, is a lesson assigned to all students so that everyone becomes thoroughly acquainted with the conventional lines in figure 14.

Supplementary lessons, such as 6*S*, 12*S*, 23*S*, may also be assigned in which event the grades earned for them are placed in the square beneath each of the lessons assigned.

There are a number of tests listed on the card. All of these are indicated, either by the letter *T* or the word *Test*. These are assigned as found necessary by the instructor, and the grades placed in the appropriate squares as already explained.

*Published by The Bruce Publishing Co., Milwaukee, Wis.

Name _____ Grade _____ Year _____

7th Grade				9th Grade				Trade				High School							
1	2	3	4	Fig. 5	6	6	7	Test											
C B A	C B A	C B A	C B A	14	C B A	C B A	S	C B A	1	1	2	3	4	5	6	7	8		
8	9	10	11		12	13	14	15	16	17									
C B A	C B A	C B A	1	2	3	4	S	C B A	C B A	C B A	C B A	C B A	C B A	C B A					
18	19	Test	2	20	21	22	23	23	25	26	Test								
C B A	C B A	1	2	3	4	C B A	C B A	C B A	C B A	S	C B A	C B A	3						
28	29	30	31	32	Test	34	37	38	38	39									
C B A	C B A	C B A	C B A	C B A	4	C B A	C B A	C B A	S	C B A									
41	42	43	44	45	46	47	48	49	49	50	51								
C B A	C B A	C B A	C B A	C B A	C B A	C B A	C B A	C B A	S	C B A	C B A								

THE TEACHING OF ELEMENTARY LOCKUP

R. W. Rueter,
Lincoln High School,
Cleveland, Ohio

The necessity for an uninvolved method of teaching elementary lockup always has and always will exist in the school print shop. The method described herein, requires a minimum of effort and time, both on the part of the instructor, and on the part of the pupils. It is designed primarily for teaching students who have had no previous instruction or experience in locking forms, and emphasizes the fundamentals, which when thoroughly mastered complete the more important portion of the entire subject of lockup. The remainder, that of applying these essentials to other more complex situations, is comparatively easy.

The groundwork for this teaching process is covered by devoting 15 or 20 minutes of a class period to a discussion concerning lockup. In this introductory preparation, the students view, for the first time, a locked form. The various tools and materials are named, pointed out, and their uses briefly explained. The main objective is recognition by the class, at the conclusion of the discussion, of each tool and piece of equipment when it is mentioned or displayed. This may be accomplished by associating the equipment with a similar tool familiar to them. For instance, in comparing the quoin key it may be pointed out that a turn of the door key keeps everything in the house, and a turn of the quoin key prevents the loss of anything from the form.

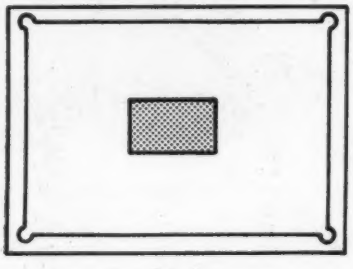


Fig. 1

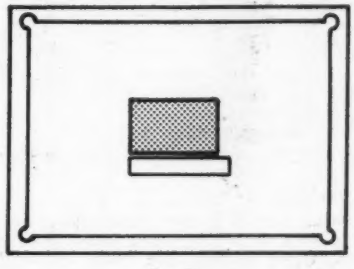


Fig. 2

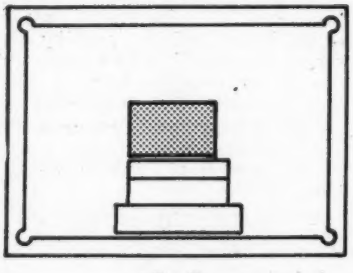


Fig. 3

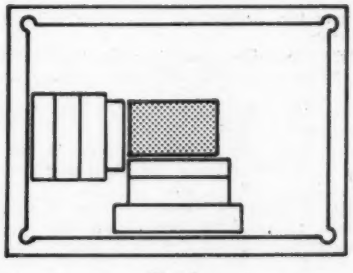


Fig. 4

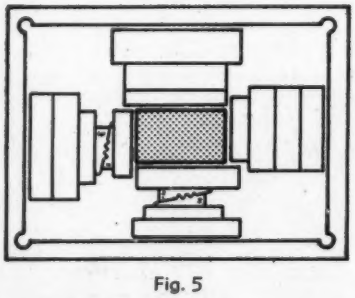


Fig. 5

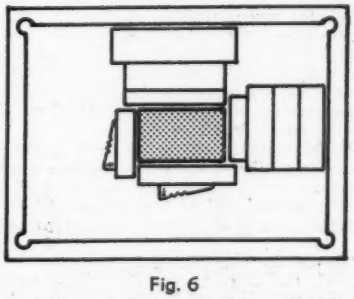


Fig. 6

The following day the class engages in a practical demonstration, under the supervision of the instructor. Each student has previously been furnished with an operation sheet which gives details of the sequential steps necessary in locking a form, and includes suitable illustrations of each. The students have been provided sufficient opportunity to carefully study the instruction sheet. During the class demonstration, interest is sustained by calling on individuals to explain and demonstrate certain steps to the remainder of the class. Although the operation sheet is simply designed, and written so that explanation is reduced to a minimum, a student will pay close attention and consequently get more good from the demonstration if he is not only asked to participate, but is called upon to criticize the explanations and demonstrations of others.

Inspection will prove that the sheet has been designed merely to teach how to lock up a simple form of two or three paragraphs, head to the left, by the *chaser* method. The basic principles of lockup are thoroughly covered and, in addition, this sheet can readily be revised, by changing a line or two, to aid the teaching of lockup for other forms.

For example, to adapt to the lockup of a form with head down: change the specifications, revise paragraph three to read ". . . so that head is down," change paragraph eleven to read ". . . starting at the top of the type form, and then the quoins at the right."

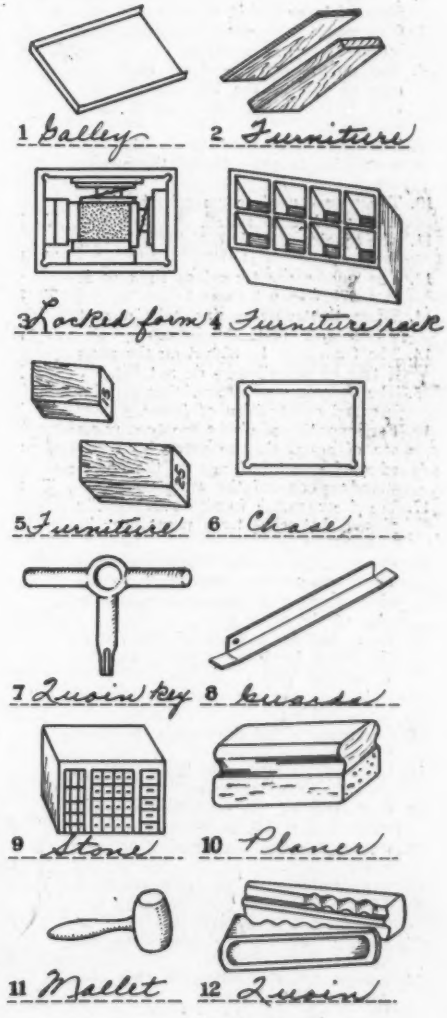
At the conclusion of the demonstration, if time allows, or if more convenient on the following day, the students are given a performance test.

The examination consists of a reproduction of a chase on a large card (the Art Department will cooperate by cutting a linoleum), an assortment of rectangular pieces of cardboard simulating wood furniture (cut to the exact length and width of ordinary furniture), another card likened to a type form (offset printing will accomplish this), triangular pieces to represent quoins, and thinner strips of cardboard cut to appear as reglets. The students are then requested to assemble these together into a *locked form,* by following the directions outlined in the instruction sheet. The assemblage of quoins, furniture, type, and reglets is pasted or pinned within the chase on the large card.

This test gives the instructor some insight as to each boy's ability to do the work, but indicates nothing concerning the boy's knowledge; that is, the precautions he should observe, when quoins should be tightened, which quoin should be tightened first, when and how he should plane the form, and the like. To ascertain this, a paper-pencil test of the objective type is administered. The following is one of several which have been used successfully:

Lockup Test

General Directions: The aim of this test is to give you an opportunity to show what you have learned about locking up type forms. It is not expected that you will be able to answer every question. Read the directions for each part care-



fully and be sure you understand what you are to do before you begin.

Part I—Identification

Directions for Part I: Identify each of the illustrations on the preceding page by writing the name of the tool or equipment on the line provided beneath each illustration.

Part II—True-False

Directions: The letters "T" and "F" follow each of the statements that follow. Place a line under the letter "T" if the statement is true. Place a line under the letter "F" if the statement is false. *Do not guess.* If you are unable to decide whether a statement is true or false, leave it alone. You will be penalized for each statement incorrectly marked by deducting one point or credit from the number of incorrectly marked statements.

Sample: The tool used for assembling type is called the composing stick. T F

Begin Part II here:

1. The *chaser* method is the most commonly used for locking small forms for the job press. T F
2. Small particles of dirt and type metal are removed from the surface of the stone before locking a job. T F
3. The type form is usually locked with the head to the right. T F
4. Furniture is first placed on the sides nearest the workman. T F
5. A great many narrow pieces of furniture are used rather than a few wider pieces. T F
6. Quoins are placed after the second piece of furniture on all four sides. T F
7. One quoin is needed for each two inches of type. T F
8. The quoins are placed so that the pointed end of the half nearest the type is toward the sides which have no quoins. T F
9. The form is checked to see that all material is in place before the quoins are tightened. T F
10. The planer used to smooth the form is covered with felt. T F
11. The quoins are first tightened with the fingers. T F
12. The quoins are turned as tight as it is possible to get them. T F
13. When tightening quoins, take one at a time and rotate the form. T F
14. The form may be placed on the press if two or three letters do not *lift*. T F
15. The procedure of determining margins is called *composition of forms*. T F
16. For securing margins when type pages are of equal size, measure from one edge of one type page to the corresponding edge of the other page. T F
17. Wood or metal furniture is usually placed between two pages to be locked. T F
18. For securing margins when type pages are of unequal size, measure from one edge of one type page to the opposite edge of the other page. T F
19. When locking a form of four pages the wood furniture is placed so that it will not bind. T F
20. *Butted* is the name of the method for unlocking. T F
21. The name of the drawers in the stone is *coffin*. T F
22. Nicks and scratches in the surface of the stone cause no harm. T F
23. Locked forms are kept in the galley rack. T F
24. Reglets are used for spacing between pages. T F
25. Reglets are six and twelve points thick. T F
26. After a form has been unlocked it is placed on a galley and tied. T F
27. Bearers prevent the rollers on the press from turning. T F
28. Bearers lift the rollers so that they do not touch the type. T F

Testing gives the opportunity for an immediate review in which any points, shown to be in need of further explanation, may be clarified.

When the teacher has satisfied himself that all the students are both *able to do* and *know* he may assign each student an individual job to be locked up. The students are still required to refer to their instruction sheets because some may be forced to temporarily postpone their experience until tools and equipment are available.

The foregoing method has proved very satisfactory over a period of years because the average pupils grasp actual lockup readily, with little help from the instructor, and the slow pupils (there are few of these when this method is employed) obtain the benefit of more individual instruction than would be received if the teacher's time were divided among all of the members of the class. All students, therefore, receive the proper foundation upon which to build their more difficult assignments.

When dealing with high I.Q. pupils, an experiment in which the preliminary demonstration was eliminated, resulted in little loss of effectiveness, thus saving additional time.

Operation Sheet—*Chaser* Method of Locking Forms

Specifications:

Lock a simple type form of two or three paragraphs in a chase.

Tools and Materials:

Tied type form on a galley, stone, chase, wood furniture, reglets, quoins, quoin key, planer, mallet.

Related Information:

The *chaser* method is the simplest and most commonly used in locking small forms for the job press. Other methods are often employed when necessary.

Procedure:

1. Clean the surface of the stone with a rag or brush.
2. Place the galley containing the type form on the stone and slide the type form unto the stone.
3. Turn the type form so that the head is to the left.
4. Place the chase around the form so that the type is in the center of the chase as shown in Figure 1.
5. Place a piece of wood furniture as wide as possible, and a little longer than the type form, along the side of the form nearest you. See Figure 2.
6. Fill in the remaining space on this side with wood furniture. See Figure 3.
7. Place the wood furniture on the left-hand side of the type form in the same manner as it was placed on the side nearest you. See Figure 4.
8. Fill in the two remaining sides in the same manner as was done for the first two sides and place a quoin after the first piece of wood furniture as shown in Figure 5.

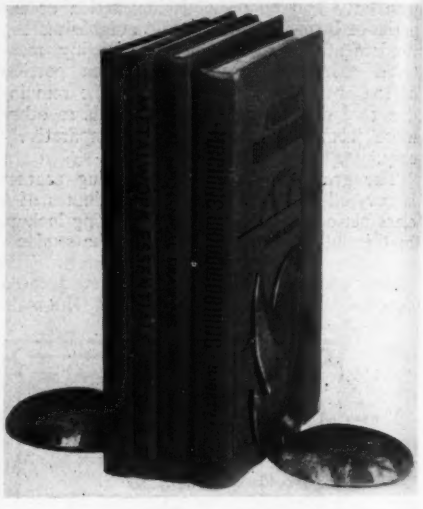
NOTE: The number of quoins used depends upon the size of the form. Allow one quoin for approximately each 4 in. Always place the quoins so that the pointed end of the half nearest the type points toward the sides which have no quoins.

9. Remove the string from the type form.
10. Check the form to see that all material is in place and in alignment, and tighten the quoins with your fingers.
11. Begin tightening the quoin with the quoin key, starting at the bottom of the type form and then the quoins at the side. Tighten one quoin at a time and rotate around the form until the form is tight.
12. Test the form by inserting the quoin key under the corner of the chase, and press down upon the letters with your fingers to see if any letters can be pushed down. If any part of the form is loose, notify the instructor.

COPPER BOOK ENDS

Harold G. Miller,
High School,
Ligonier, Ind.

The book ends described herein have become very popular in my freshman shop classes. The boys enjoy making them more than any other project. They were tops in the annual exhibit, too, so much so, that a number of girls have enrolled in the class this year in order to make a pair.



Copper book ends

The project can be made with very little equipment. The base is hammered out and filled with lead. In order to get the lead to stick when poured into the base, tin the copper on the inside of the base first. The design in the leaf is shaped by placing the copper on a board and on top of the copper place a wire shaped to form the design in the leaf. Then strike the wire with a hammer just enough to leave an impression in the copper. The usual method of finishing copper is employed. A piece of felt may be glued to the base.

SOLDER ECONOMY

Einar E. Siro,
Public Schools,
Minneapolis, Minn.

Misuse and waste of solder by students in the shop can easily become a very expensive

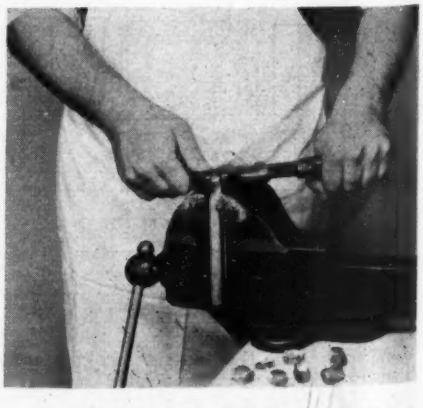


Fig. 1. Method of cutting bar solder using a vise and a monkey wrench

item. The following is a short description of a method that has been found to be most economical.

The solder is purchased in the bar form. It is then cut into pieces approximately ½ in. long. This can be done by clamping the bar in a vise, as shown in Figure 1, so that one end projects approximately ½ in. above

Fig. 2. Using solder that is kept on a tin can cover

the jaws. The projected end is then grasped tightly with a monkey wrench close to the jaws of the vise and the wrench twisted around, thereby shearing the bar in two.

These pieces of solder are placed on tin-can covers as shown in Figure 2. This serves a threefold purpose; first, students are unable to carry solder away from the shop as the cover is fastened to the bench with a small screw or wire brad. Second, solder is not wasted as only the proper amount is picked up by the soldering copper. Third, students get into the habit of having their soldering coppers tinned properly at all times as solder cannot be picked up satisfactorily with a poorly tinned copper. Pieces of solder are given students to place on the covers as needed.

ART METALWORK

V. P. Conners,
Christopher Gibson School,
Boston, Mass.

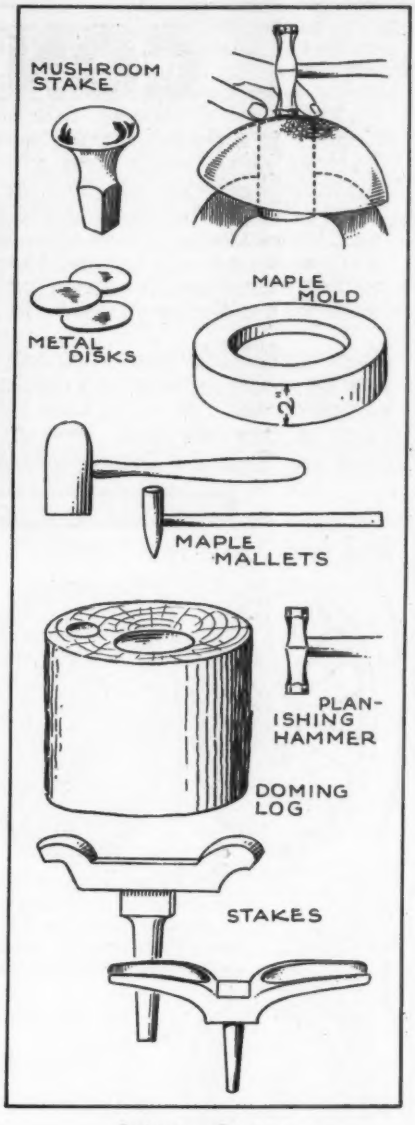
(Continued from page 37, January, 1941, issue.)

Raising or Forming

Raising a shallow bowl: Metals most commonly used in raised work are copper, brass, aluminum, pewter, and silver. The necessary equipment consists of a vise, hammers, mallets, wooden molds, files and stakes of various shapes and sizes. The object is to hammer up any desired shape from a flat piece of metal.

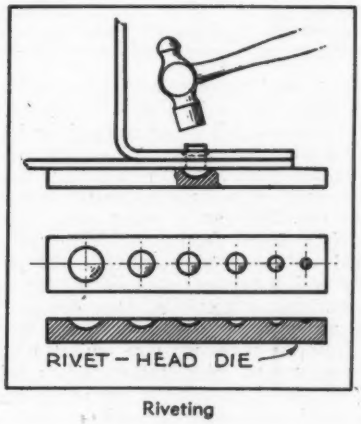
Several methods may be used. The skilled craftsman may raise a bowl using only hammers, doming mallets, and stakes held securely upright in a vise. The beginner, however, will have very little success without the use of molds. First cut a circular disk from a flat piece of metal either 18 or 20 gauge. File around the edges until smooth and neat, then clean in a pickling solution of sulphuric acid, rinse well, and dry. Hold the disk over a shallow mold. Hammer lightly with wooden mallet or ball-peen hammer moving the disk around after each blow. If copper, brass, or silver is used, the metal must be annealed at the end of each round to soften it.

To anneal copper, hold the metal over a flame until red hot, then remove and quench in cold water. Brass, on the contrary, should be



Raising — Forming

cooled slowly. When this process is completed, the metal must again be cleaned and then planished. Planishing is a finishing process used to even up the work. It also decorates the surface of the metal with bright facets produced by the blows of the planishing hammer.



Riveting

In order to planish evenly, mark a few circles around the bowl from the center to the outer edges. A round stake similar to the shape of the bowl may be used.

The bowl should be planished until smooth, then the edges of the bowl may be filed and rubbed with emery cloth. Place the bowl upside down on the table and if all sides touch and the work is evenly balanced the bowl will be true. The bowl is now ready for decorating and polishing. One form of decoration is crimping which may be done by placing the bowl over a notched block and hammering the edge of the bowl into the block at evenly spaced intervals. Other forms and finishes could also be added to this bowl.

Riveting

Another form of decoration can be obtained by the use of rivets in design. Although this method is used quite commonly, riveting is always associated with the fastening together of two pieces of metal. Riveting is by far the easiest way of fastening two pieces of metal firmly together.

Rivet sets, special hammers, and the like can be bought, but this is written so the home craftsman with very few tools and limited money can do it. Rivets of any kind of metal can be bought or they may be made by turning down a piece of wire. In art metal, round-head rivets are usually used, because they will also serve as decoration. In ordering rivets, specify the shape of the head, then the diameter, and finally the length, thus: r.h. ¼ by ¾ in. They are sold by the pound.

The size of the head varies with the diameter of the rivet, so take a piece of iron or steel, and with a hand drill and different sizes of drills, make a series of depressions that will fit the head of the various sized rivets.

Directions: Drill or punch holes in both pieces of metal so that the rivets will fit tightly. Cut the shank of rivets allowing 1/32 or 1/16 in. to protrude. Countersink the hole from the bottom so the rivet will have somewhere to catch when it is hammered over. Place rivet through hole. Place rivethead in its correct depression in the rivethead die, and hammer end of rivet until both pieces of metal are fastened firmly.

Heads of rivets can be treated in design. After the rivet is set, the heads may be filed so that they look like rosets, petals, or leaf forms.

Riveting is always carried on in the same manner, whether it is done purely for decoration or merely for holding pieces together.

When both ends of the rivet are to be round, a rivet set must be used when performing the riveting operation. Rivet sets come in different sizes to accommodate the various sizes of rivets. For the home craftsman the first method described is the most desirable and inexpensive.

Rules for riveting:

1. Select rivet before drilling or punching holes.
2. Test drill first on scrap pieces and if satisfactory, go ahead.
3. Check all holes before drilling, being sure that they are aligned.
4. Cut shank off so that rivet extends 1/32 or 1/16 in. beyond the metal. Never allow more than the diameter of the rivet for this extension.
5. Countersink hole from bottom.
6. Check each rivet before going on to the next.

Chasing

Chasing is the lining in of a design on metal. There are two forms, one is flat and the other is raised. This operation is also known as repoussé, which is the French word for it. It is suggested that the student first model in clay or plastine, but as this is written for the beginner or home craftsman, we could suggest that a design well made and not too difficult be used.

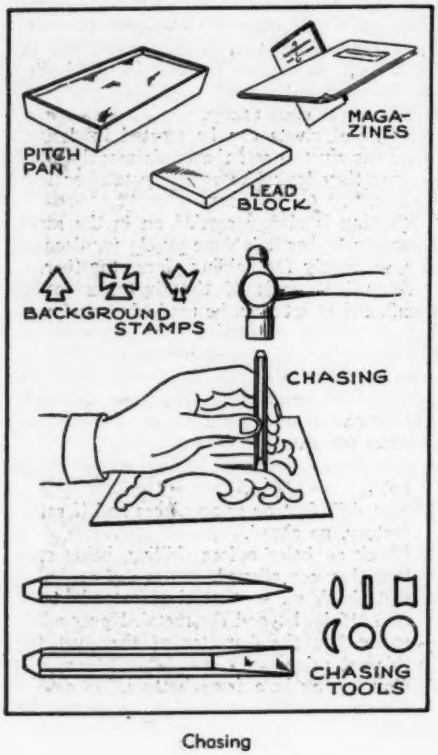
In making a design, keep the limitations of the available tools in mind. The tools suggested are: chasing tools (set of six or eight different shapes), a chasing hammer, round-head mallet, pitch pan, bottle of machine oil, an old telephone book or some old magazines. Craftsmen often have as many as 50 chasing tools, but six or eight are enough for the beginner and he may add to them as the need arises. A pitch pan is convenient, if one is working where heat is available. A pad of paper or a lead block may be substituted, however.

Formulas for pitch pan:

5 lb. pure burgundy pitch
¼ lb. mutton tallow
2 lb. plaster of Paris

Heat pitch until melted, then add mutton tallow, and finally sprinkle and stir in the plaster of Paris. See that the three ingredients are well mixed. This will produce a real good pan of pitch.

The design is first transferred to the metal in one of the ways already suggested. Go over this design with a tracer or scratch awl. Place the metal on a piece of soft wood, or on a magazine, or on the pitch in the pitch pan, and with a chasing set, go over the design until it shows on the back. The chasing tool is held between the thumb and first two fingers of the left hand and the chasing hammer is worked with the right hand with a wrist movement. One method calls for holding the tool erect and moving it along as needed, while the other is holding it on an angle toward the body and the pressure of the hammer will send it forward.



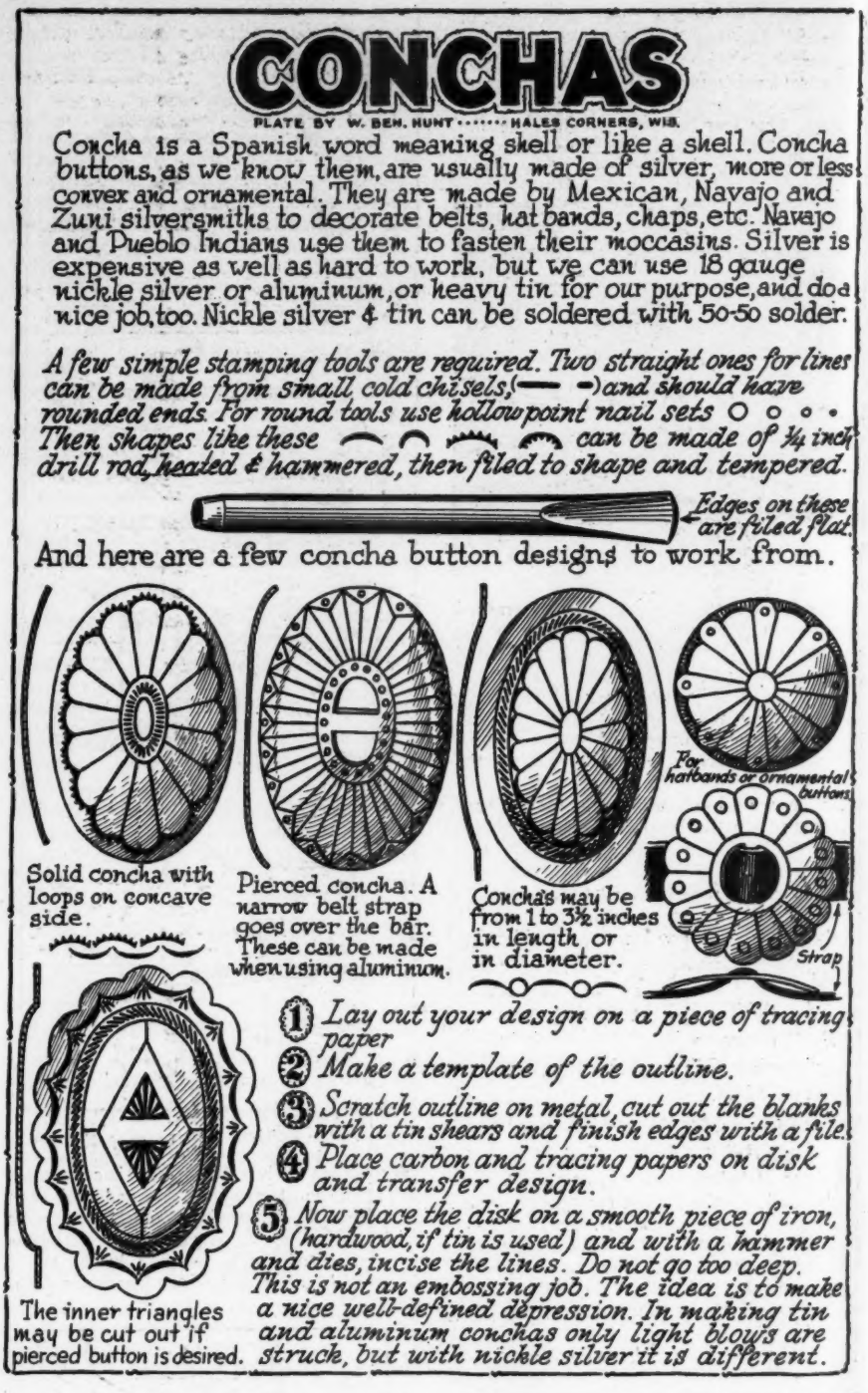
Chasing

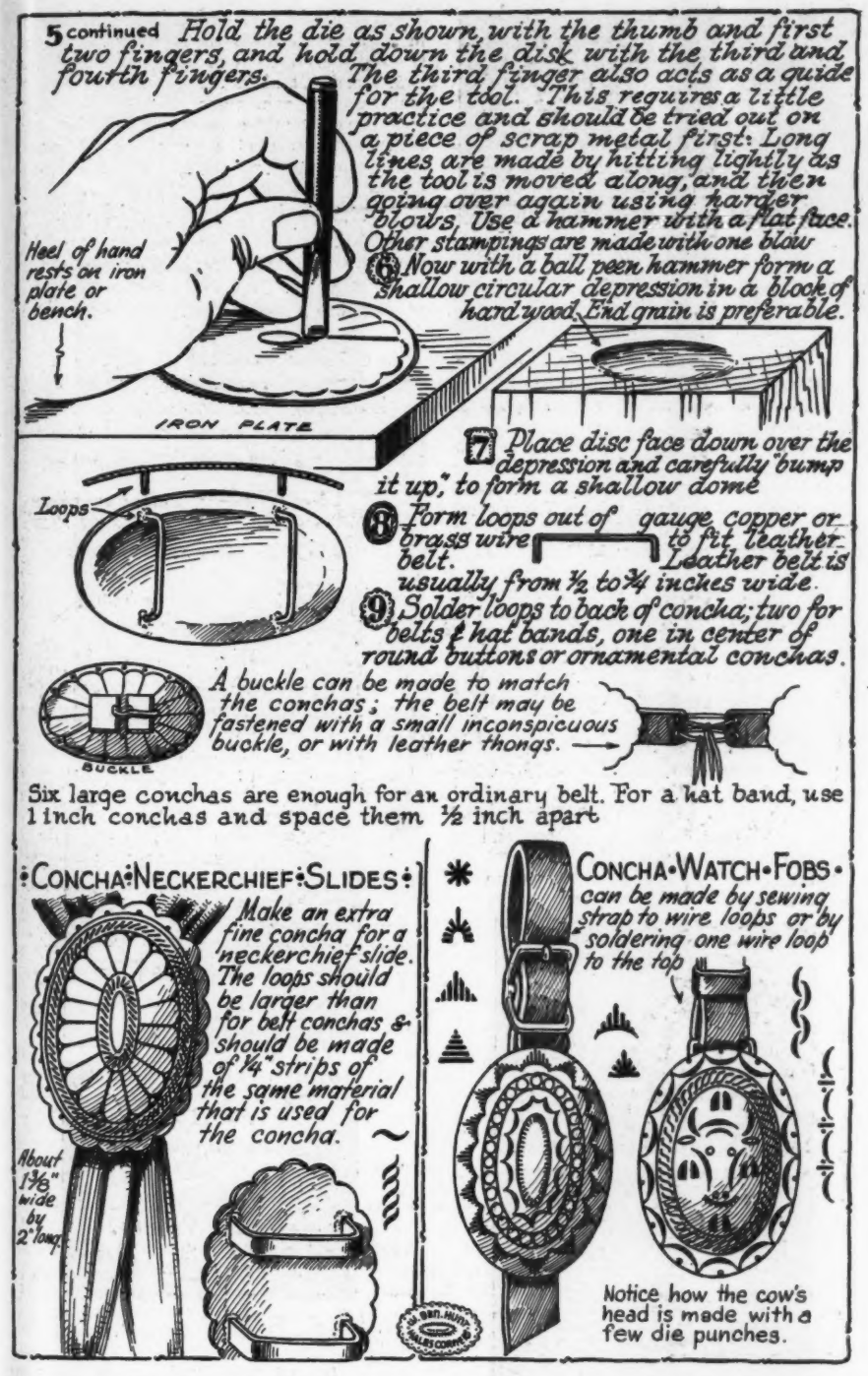
Once the design has been chased and shows on the back, it is ready to start working it up. If the pitch pan is being used, oil the face of the metal because the design will be worked up from the back. Heat the pitch evenly until it becomes softened, oil top surface and place metal on, face down. The metal will hold onto this surface, and it will also have the necessary give underneath. If the magazine or thick leather pad is being used, do not oil, but put the face of the metal down on the pad and go to work.

Find the chasing tool that best fits the shape or shapes that are to be raised. Work slowly and carefully avoiding any forcing. If the work is done on the pitch pan, and the pitch has cooled, reheat, soften, then proceed. After a little working, turn metal over and check progress. Metal can be removed from the pitch pan after the pitch has been softened and if it has to be replaced always oil the surface which will come in contact with the pitch.

The metal is bound to harden after some hammering, so remove and anneal. Copper may be dipped in water to cool but the cooling of brass must not be hurried in any way.

In completing the design, work from one


CONCHAS
PLATE BY W. BEN. HUNT ····· HALES CORNERS, WIS.
Concha is a Spanish word meaning shell or like a shell. Concha buttons, as we know them, are usually made of silver, more or less convex and ornamental. They are made by Mexican, Navajo and Zuni silversmiths to decorate belts, hat bands, chaps, etc. Navajo and Pueblo Indians use them to fasten their moccasins. Silver is expensive as well as hard to work, but we can use 18 gauge nickle silver or aluminum, or heavy tin for our purpose, and do a nice job, too. Nickle silver & tin can be soldered with 50-50 solder.
A few simple stamping tools are required. Two straight ones for lines can be made from small cold chisels, (— —) and should have rounded ends. For round tools use hollow point nail sets ○ ○ ○ • Then shapes like these ⌒ ⌒ ⌒ ⌒ can be made of ¼ inch drill rod, headed & hammered, then filed to shape and tempered.
Edges on these are filed flat.
And here are a few concha button designs to work from.
Solid concha with loops on concave side.
Pierced concha. A narrow belt strap goes over the bar. These can be made when using aluminum.
Conchas may be from 1 to 3½ inches in length or in diameter.
For hatbands or ornamental buttons
Strap
The inner triangles may be cut out if pierced button is desired.
1 Lay out your design on a piece of tracing paper
2 Make a template of the outline.
3 Scratch outline on metal, cut out the blanks with a tin shears and finish edges with a file.
4 Place carbon and tracing papers on disk and transfer design.
5 Now place the disk on a smooth piece of iron, (hardwood, if tin is used) and with a hammer and dies, incise the lines. Do not go too deep. This is not an embossing job. The idea is to make a nice well-defined depression. In making tin and aluminum conchas only light blows are struck, but with nickle silver it is different.


5 continued Hold the die as shown, with the thumb and first two fingers, and hold down the disk with the third and fourth fingers. The third finger also acts as a guide for the tool. This requires a little practice and should be tried out on a piece of scrap metal first. Long lines are made by hitting lightly as the tool is moved along, and then going over again using harder blows. Use a hammer with a flat face. Other stampings are made with one blow
Heel of hand rests on iron plate or bench.
IRON PLATE
6 Now with a ball peen hammer form a shallow circular depression in a block of hard wood. End grain is preferable.
7 Place disc face down over the depression and carefully "bump it up," to form a shallow dome
Loops
8 Form loops out of gauge copper or brass wire to fit leather belt. Leather belt is usually from ½ to ¾ inches wide.
9 Solder loops to back of concha; two for belts & hat bands, one in center of round buttons or ornamental conchas.
BUCKLE
A buckle can be made to match the conchas; the belt may be fastened with a small inconspicuous buckle, or with leather thongs.
Six large conchas are enough for an ordinary belt. For a hat band, use 1 inch conchas and space them ½ inch apart
CONCHA·NECKERCHIEF·SLIDES
Make an extra fine concha for a neckerchief slide. The loops should be larger than for belt conchas & should be made of ¼" strips of the same material that is used for the concha.
About 1⅜" wide by 2" long
CONCHA·WATCH·FOBS
can be made by sewing strap to wire loops or by soldering one wire loop to the top
Notice how the cow's head is made with a few die punches.

side to the other until the desired result is obtained. If portions of background need to be of a different texture, either planish or use a background tool.

No set of rules can be made regarding the choice of tools but the general rule is to choose the tool that best fits the shape being raised at the time.

The next important thing to be remembered is that the metal must be kept soft and workable at all times. As with all processes, one becomes more proficient with practice, and will be able to use one particular tool for many different shapes.

These tools may be made at home by using ⅛ to ¼-in. tool steel cut in lengths of 4 or 5 in. The ends may be shaped on a grinding wheel or with a file, after which they should be polished with a fine emery cloth and buffed.

MAKING A QUART CUP

R. W. Wagner,
St. Paul, Minn.

Cutting the Body

1. Get a piece of IC tin plate from the instructor. Stamp your number in the middle of it.

2. Decide on two working edges and mark them.

3. Lay out the two lines where the metal will have to be cut to make it the proper size.

4. Cut off the *short* edge with the squaring shears. For this cut use the side gauge as shown in Figure 1.

5. Cut off the *long* edge. Do *not* use the side gauge this time, but make the cut in the middle of the bed as shown in Figure 2.

6. Have the instructor check the squared piece.

Fig. 1. Using side gauge for short cut.
Fig. 2. Side gauge is not used for the long cut

Fig. 3. Scribing the notches with divider

7. Scribe the notching at the four corners as shown in Figure 3. Do not lay out the hem allowances, and do not do any cutting.

8. Have the instructor check the layout of the notches.

9. Notch the four corners.

Folding the Edges

1. Have the instructor show you a sample of a folded body.

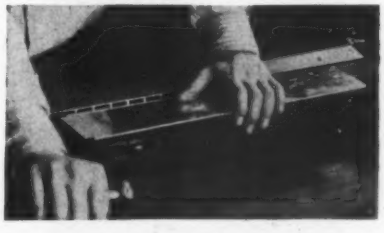


Fig. 4. Hemming long edges

2. Put the double hems on the two long edges first, as in Figure 4. Have the hems on opposite sides of the sheet!

Fig. 5. Turning open hems for the grooved seam

3. Turn the single edge to an open hem as in Figure 5. Leave the bar set as it was.
4. Turn half the double edge in the opposite direction and leave it an open hem. Leave the bar set as it was. Don't fold the double edge twice!

Rolling the Body

1. Get the rolls ready for rolling.
   a) Close the latch before starting. See Figure 6.

Fig. 6. Closing the latch. Fig. 7. Adjusting the lower gripping roll. Fig. 8. Adjusting the rear roll

   b) Adjust the lower front roll so it will be far enough from the top roll to allow the hems to pass between the rolls without being mashed. See Figure 7. Use both hands. Be sure the rolls are parallel.
   c) Adjust the rear roll so the metal will not be rolled too small the first time through. Stand up and use both hands as in Figure 8.

Fig. 9. Curving the end of the metal. Fig. 10. The end curved, ready to roll

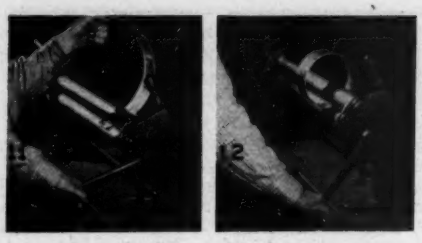


Fig. 11. First pass through the rolls. Fig. 12. Final pass through the rolls.

2. Curve the end of the sheet before rolling it. Slip the end of the sheet between the rolls as in Figure 9 and push it upwards. This puts a curve in the end which can be seen in Figure 10. Place the metal so the single edge will be down.
3. Roll the sheet into a cylinder. The first time through the rolls the sheet should not be formed small enough. See Figure 11. Raise the rear roll and continue rolling. When complete, the ends should lack about ½ in. of coming together. See Figure 12.
4. Remove the cylinder from the rolls.
   a) Open the latch as shown in Figure 13.
   b) Pull on the lifting lever as shown in Figure 14.
   c) Slip the cylinder off the roll as shown in Figure 15.
5. Have the instructor inspect the work.

Closing the Grooved Seam

1. Select a groover about 1/16 in. wider than the single edge.
2. Place the cylinder on the hollow mandrel stake, with edges locked. Close one end of the seam as in Figure 16.
3. Lock the other end of the seam as shown in Figure 17.

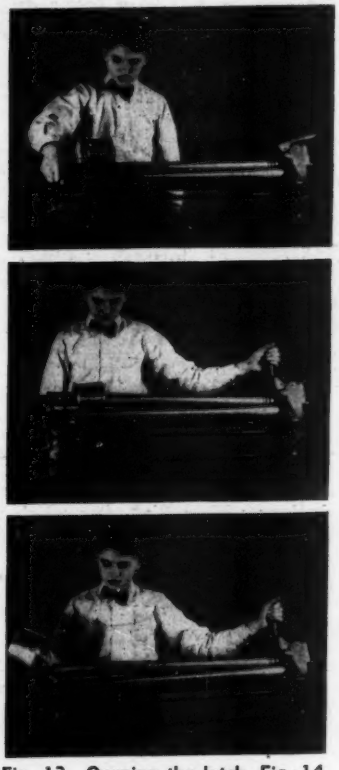


Fig. 13. Opening the latch. Fig. 14. Raising top roll with lever. Fig. 15. Slipping off the cylinder

4. Close the rest of the seam as shown in Figure 18. Move the groover along the seam striking it as it moves. Use a mallet.
5. Dress the seam by striking it with a mallet as shown in Figure 19.
6. Have your work inspected by the instructor.

Making the Bottom

1. Get a compass ready for use as follows:
   a) Turn the fine adjustment so it is

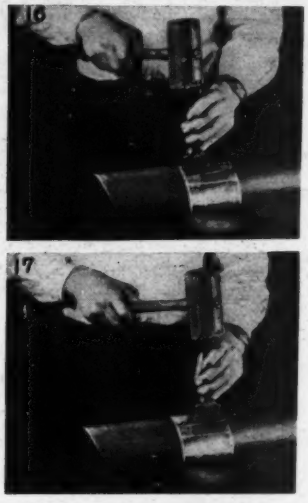


Fig. 16. Closing first end of seam. Fig. 17. Closing other end

Fig. 18. Closing remainder of seam. Fig. 19. Dressing seam with mallet

not too loose and yet not clear up tight. See Figure 20.
   b) Adjust the points so they are even. Press them down on a bench as shown in Figure 21.
2. Set the compass for drawing the circle.
   a) Loosen the coarse adjustment. Place one point on the 1 in. division, and move the other to get the proper setting as shown in Figure 22.
   b) Tighten the coarse adjustment firmly. See Figure 23.
   c) If necessary readjust the points with the fine adjustment as shown in Figure 24.
3. Have the instructor check the setting of the compass and at the same time get

Fig. 20. Getting thumb-nut adjusted.
Fig. 21. Evening up the points

Fig. 22. Setting the compass. Fig. 23. Tightening the coarse adjustment. Fig. 24. Final checking and adjustment. Fig. 25. Drawing diagonals

a piece of metal for making the bottom.

4. Locate a center point on the metal as follows:

a) Draw two diagonals on the metal as in Figure 25.

b) Make a light prick mark at the point where the diagonals cross, as in Figure 26. Use a mallet. Don't punch a hole!

5. Draw the circle. Hold the compass by the hinge and lean the top forward slightly as shown in Figure 27. Make one mark only. Don't squeeze the compass as shown in Figure 28. Don't use two hands as shown in Figure 29.

Fig. 30. Waste metal should come off in one piece

6. Cut the bottom. Use straight snips and leave the waste metal all in one piece as shown in Figure 30.

7. Fit the bottom in place and have the bottom checked.

Fig. 26. Prick punching center point. Fig. 27. Proper way to swing compass. Fig. 28. Improper way to hold compass. Fig. 29. Another wrong method to avoid

Fig. 31. Starting bend in top of handle.
Fig. 32. Finishing curve in top. Fig. 33. Forming bottom of handle

Making the Handle

1. Get a piece of metal for making the handle.

2. Draw a center line lengthwise of the metal. From this make the layout of the handle. Have the layout checked, then cut the handle.

3. Form the handle.

a) Hem the edges.

b) Use a mallet to form the curve. Begin at the top end as shown in Figure 31.

c) Continue by pushing the metal forward, striking it as it comes. See Figure 32.

d) Use the hollow mandrel stake for forming the lower part of the handle. See Figure 33.

4. When the handle fits the cup properly, have the instructor inspect it.

Soldering

1. Get out a soldering copper. If there are none well tinned, show one to your instructor. He will tell you if it is to be tinned. If you tin it, be sure to have it inspected after you have done that job.

2. Solder the bottom first. Clamp a strip of wood in a vise at about the angle shown in Figure 34. This is to hold the bottom in place. Hold the cut with the left hand as shown in Figure 35. Dust a little powdered rosin into the seam as shown. Hold a properly heated copper on the seam so the two flat sides will fit as close into the seam as possible. See Figure 36.

3. Solder the grooved seam on the inside.

4. Solder the handle last. Locate the handle on the grooved seam and hold it in place with the left thumb. Hold the cut at the angle shown in Figure 37. Hold the copper

Fig. 34. Placing the strip of wood.
Fig. 35. Proper way to hold the cup. Fig. 36. Soldering bottom of cup

Fig. 37. Proper position for soldering the bottom of the handle. Fig. 38. Proper position for soldering the top of the handle

as flat against the seam as possible. For soldering the top of the handle, hold the cup in the position shown in Figure 38.

5. Have your job inspected.

"Today, with vastly increased leisure and educational facilities, the common workingman can become as broadly educated as were formerly only the aristocratic few. And if the masses are taught to use their leisure in such a way as to enrich their lives, this can be made a more civilized world." — *Harry A. Overstreet.*

RABBETED T SQUARE

Jos. J. Lukowitz,
Milwaukee, Wis.

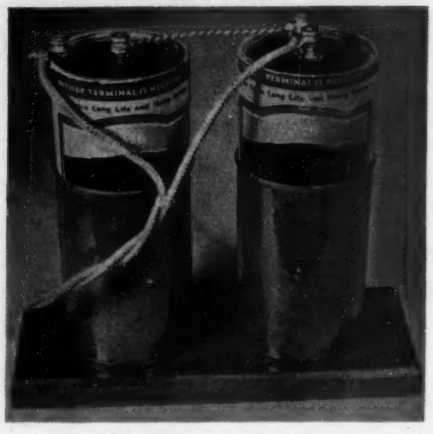
Drawing boards, especially those in the drafting room, are subjected to hard use and frequently the arris of the board is bumped against tables or benches resulting in splinters being pushed over the edge. A nonrabbeted T-square head will not contact the edge of the drawing board when the arris of the board has been nicked in this way, and the consequent rocking of the square will result in the drawing of lines which are not parallel. A small piece of eraser dust or some other substance may become wedged into the sharp corner between the head and the blade of the nonrabbeted T square and this also will prevent the head of the square from making good contact with the edge of the board.

Cheap T squares which are not rabbeted, usually are not glued. It is, therefore, a simple matter to remove the screws, rabbet the head, and reassemble the T square. The rabbet should be cut about one sixteenth inch each way. Before removing the screws, the blade and head of each T square should be identified by marking so that each blade will be fastened to the proper head.

DRY-CELL HOLDER MADE OF TIN CANS

John M. Avery,
High School,
Holley, N. Y.

A very handy holder for common No. 6 dry cells may be made by mounting tin cans on a suitable base with wood screws or small bolts. The cans in which soup is commonly packed are a very snug fit for the average



dry cell. By using this device the cells can be kept together and are much handier to use around the shop. Units can be made in any desired size, but the two-cell size is usually all that is required.

FOLDING CARD TABLE — FIREPLACE SCREEN

Chris H. Groneman,
Automotive and Mechanics College,
College Station, Texas

The project described herein may well serve a dual purpose, since it can be used both as a fireplace screen and as a card table. The top may be made to show a very attractive display of woods and their grain as shown in Figure 1. Many manufacturers now feature card table tops of this type with beautiful veneer patterns. A project such as this is rather unique in that it offers a variety of manipulative experiences, and is well received by the parents. After it is completed, it will be in constant use at home.

It is not necessary to have a great amount of power equipment, with the exception of the wood lathe, to make this table. However, certain machines will prove to be quite an aid in its construction. It is suggested that this project be made of a durable and colorful wood such as walnut or mahogany.

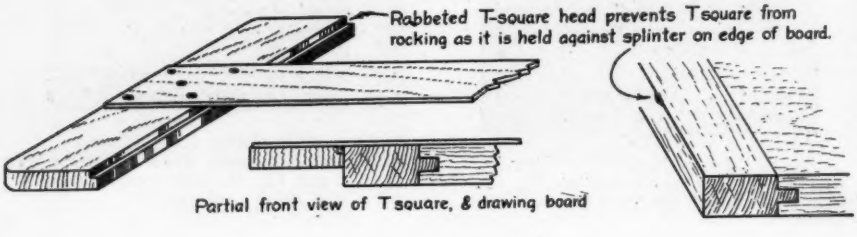
The curved legs as shown in details *B* and *C*, Figure 2, should be made of 1¼ in. stock to offer sufficient rigidity in the folding and setting up of the table. In order to insure accuracy in the cutting of these legs, it is advisable to make a full-sized template on the basis of the detailed drawing. Two of each of the legs *B* and *C* are required.

It will be noticed in detail *D* that there is a ⅝-in. slot cut to a ¾-in. depth. This slot or groove has been widened at one end considerably to take care of the dowels in the ends of the cross member fastened to the upper ends of legs *B*. This cross member should be glued and screwed to legs *B*.

Two designs have been suggested, both of which are attractive, for the turned piece, detail *A*, upon which the legs pivot. In the assembly, legs *B* should operate freely on the dowel ends of the turning, but legs *C* should be glued to the turning, leaving only enough space for the legs *B* to pivot freely.

The molding for edges of the top may be made or purchased to suit the taste of the individual. Detail *D* is fastened to the top by means of flatheaded screws. When all parts have been assembled, it becomes a problem to file the tips of the feet so that the top will be level and horizontal, and also, when the table is folded, that it stands vertical. After the necessary sanding, this project is ready for the finish which will depend largely upon the judgment of the teacher and the ability of the student.

Fig. 1. Can be used as a card table or as a fire screen


Rabbeted T-square head prevents T square from rocking as it is held against splinter on edge of board.
Partial front view of T square, & drawing board

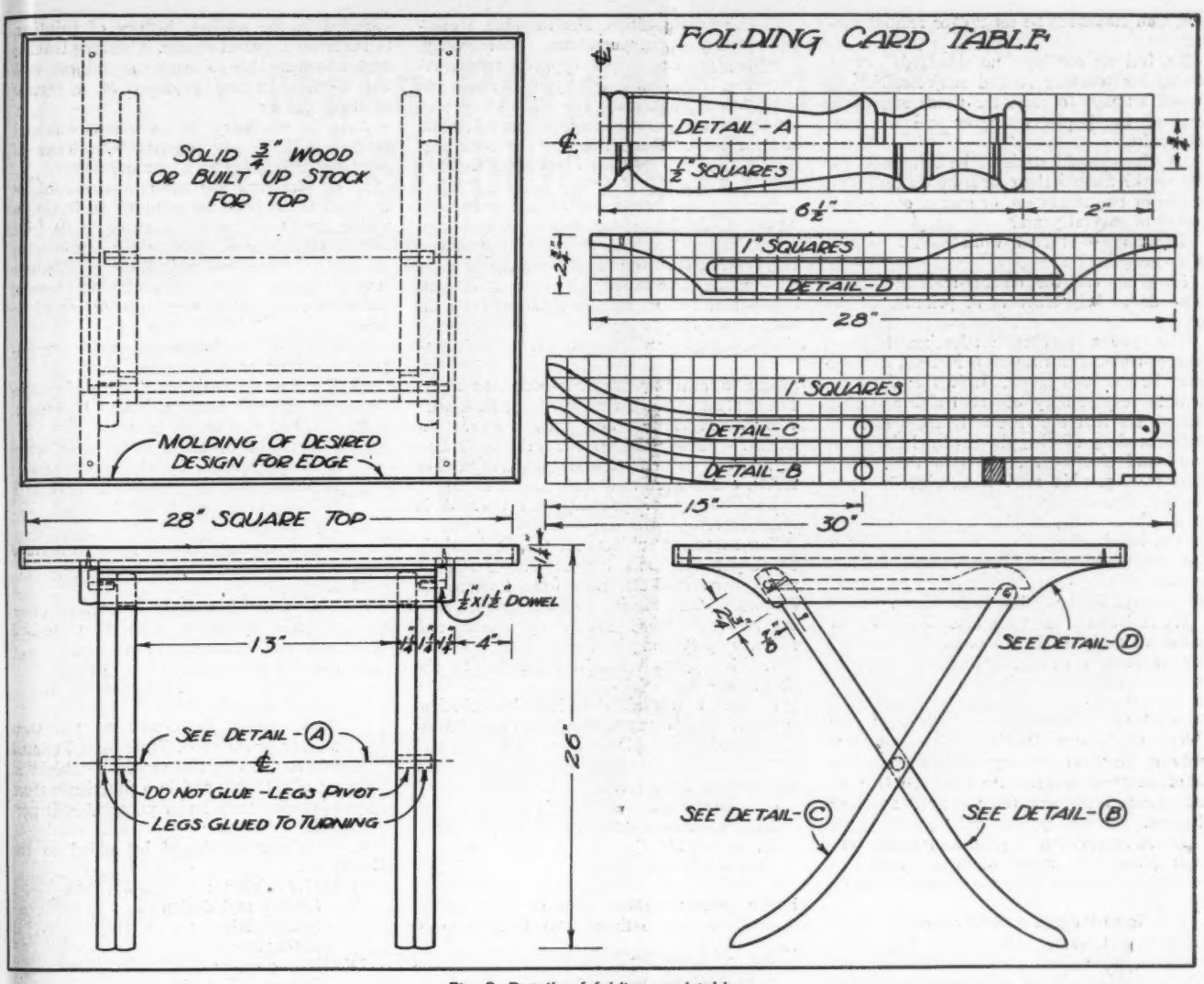


Fig. 2. Details of folding card table

PRINTING TEACHERS GIVE VIEWS IN SYMPOSIA

R. Randolph Karch,
Principal, Printing High School, Cincinnati, Ohio

Related-Subjects Symposium for Junior High Schools

Related material is the information on various phases of the graphic arts usable by pupils on a junior high school level in courses for orientation and exploration.

1. Of what importance is the history of printing? Should it be a course by itself, or included in another course?

The history of printing should be taught by the printing instructor as an enrichment to the various areas as needed.

2. Is it necessary for a related-subjects teacher to have any practical knowledge of printing? Should he be a printer? Why?

The instructor should have a usable knowledge of area content, so that he can demonstrate and carry on research for the boys.

(This question carries *vocational* implications.)

3. Which of the following courses are important enough to be taught?

a) English, or printer's English.
b) Accident and health hazards.
c) Psychology.
d) Economics.
e) History of printing.
f) Actual related subjects, such as machine composition, electrotyping, stereotyping, photoengraving, photography, papermaking, paper, copperplate engraving, lithography, collotype, and gravure.

The first five should be incorporated in the daily work as boys use the material, and not as separate lessons.

f) We should have information and a demonstration of all these areas, time allowing, and the group being able to absorb the material. These areas should be carried on through instructional material, visits, and samples from actual trade practice. Instructor should use, more often, the material that is available on various related subjects.

4. What courses should be added to the foregoing list?

Linoleum, wood and rubber plate cutting, silk screen, bookbinding, inking, marbling, rollermaking, rubber-stamp making, etchings, and platemaking, multigraphing, mimeographing, multilithographing, gelatine process, photostat process, color appreciation, advertising, embossing, thermography, die cutting, facsimile printing, and chemistry of materials.

Industry should provide information and samples of materials such as gold leaf, glue, paste, thread, cold, spiral binding, stitching, individual wire staples, etc.

5. Are related subjects really "related"? If not, what can be done to remedy the situation?

We should make a greater attempt to correlate the work of the graphic arts through the academic teachers of the general objectives of the school in light of our own objectives. We should emphasize, whenever there is interest, the handicraft and hobby sides of these areas.

6. Should statistics, putting printing and publishing in their order in the major industries, be taught?

Each area, phase, or unit of instruction as it is taught should emphasize the occupational information and its economic importance in society.

7. Should the following be incorporated into a course: number of workers in the industry, average national and local salaries, etc.?

See No. 6 for answer.

8. Should the duties of workers be taught in the related-subjects class?

See No. 6 for answer.

9. Can standards be set up for related subjects?

We feel on our level no standards can be set up for teaching related subjects, but we should attempt to meet the needs and problems of the pupils whenever and wherever they arise.

10. How should students be scheduled for this work? Should the course be concentrated in one or two semesters, or spread out over a period of several years?

Vocational — student work should be tied in as needed.

11. What can the teacher-training institutions do to help teachers of printing in this area?

The young teacher graduating from a teacher-training institution is inclined to teach what he has been taught. It is, therefore, the definite responsibilty of the training institution to see that the student-teachers have an understanding of the philosophy behind the work and also of the skills in the various phases of graphic arts. Also, that the new teacher should have a knowledge of layout in all these areas, so that when he goes out on the job, he has a definite understanding of the needs and also of the ramifications of graphic arts, and that he can carry out a suitable course in the junior high school.

We feel that these same teacher-training institutions ought to have a program of courses for teachers in service, so that they may go to the teacher-training institute to receive aid in certain phases of graphic arts on which they are not competent.

The teacher-training institutions ought to provide practical printing courses (shop and laboratory) on a graduate level, so that we can secure credit for them toward advanced degrees.

12. Is supervision of printing teachers on a high plane? Is undue difficulty had with scheduling, getting adequate supplies, production, etc.?

It is, in so far as a definite course in related subjects, but we feel that we are not getting adequate supervision from our school system. The supervisor should recognize the need for materials that may be considered out of the ordinary.

Related-Subjects Symposium for Senior High Schools

Related-subject-matter material is that part of the course of study comprising the information which is not taught through actual shop projects or problems.

1. Of what importance is the history of printing? Should it be a course by itself, or included in another course?

The history of printing should be part of the background of every student taking senior high school printing. It should be taught along with the jobs in the shop, when and where applicable.

2. Is it necessary for a related-subjects teacher to have any practical knowledge of printing? Should he be a printer? Why?

All senior high school printing teachers also teach related subject matter.

3. Which of the following courses are important enough to be taught?

a) English, or printer's English.
b) Accident and health hazards.
c) Psychology.
d) Economics.
e) History of printing.
f) Actual related subjects, such as machine composition, electrotyping, stereotyping, photoengraving, photography, papermaking, paper, copperplate engraving, lithography, collotype, and gravure.

English is important. The material covered should include proofreading, printer's English, and the use of the dictionary. The book suggested were by Wooley, DeVinne, and the I.T.U.

Accident and health hazards are important. There should be safety sheets for each machine. There should be posters in the room. Safety devices such as guards should be used. All fooling around in the shop should be eliminated. Posters may be obtained from the American Safety Council.

Psychology is not important.

Economics should be included with the emphasis toward the consumer-education angle. Books recommended were Florence E. Clark's *The Printing Trades and Their Workers*, the U.T.A.'s "Economics in the Printing Industry," trade journals and local surveys. The I.T.U. courses are also recommended.

The history of printing was covered in question 1.

The suggested subjects are taught definitely by very few schools, but all schools at least touch upon it. References were *Commercial Engraving and Printing* by Hackleman, *Printing and the Allied Trades* by Karch, and *Practice of Printing* by Polk.

4. What courses should be added to the above list?

Courses to be added include bookbinding, silk screening, thermography, linoleum blocking, gold-foil stamping, offset, stenciling, and embossing. The book by Biegeleisen on silk screening is recommended.

6. Should statistics, putting printing and publishing in their order in the major industries, be taught?

This is covered under 3.

7. Should the following be incorporated into a course: number of workers in the industry, average national and local salaries, etc.?

This is included in answer to 3.

8. Should the duties of workers be taught in the related-subjects class?

Yes, this is covered in Economics — 3.

9. Can standards be set up for related subjects?

Standards can be set up.

10. How should students be scheduled for this work? Should the course be concentrated in one or two semesters, or spread out over a period of several years?

It should be taught at the point in the course where the boy needs it and where it will be of the most value to him.

11. What can the teacher-training institutions do to help teachers of printing in this area?

The institutions are doing their part.

12. Is supervision of printing teachers on a high plane? Is undue difficulty had with scheduling, getting adequate supplies, production, etc.?

Supervision is on a low plane. There is not much difficulty involved in scheduling, getting adequate supplies, etc., generally.

Related-Subjects Symposium for Vocational Schools

1. Of what importance is the history of printing? Should it be a course by itself, or included in another course?

It was decided that there is enough material included in the subject, history of printing, to make up a special course. A history teacher would be best able to teach this subject with the cooperation and guidance of a regular printing teacher.

2. Is it necessary for a related-subjects teacher to have any practical knowledge of printing? Should he be a printer? Why?

It is necessary for most related-subjects teachers to be practical printers. In instances where conditions permit a single trade in a related class it would be best for that teacher to be a tradesman but in such instances where several trades are represented in several classes the related-subjects teacher would be best.

3. Which of the following courses are important enough to be taught?

a) The fundamentals of English plus special printer's English, should be taught.
b) Accident and health hazards.
This should be taught in the shop, when it is appropriate, by the shop teacher. Health should be included as part of a full course in health and hygiene.
c) Psychology.
No, psychology has no place in a trade school as a separate course.
d) Economics.
This should be taught as part of other subjects, by dealing with the wage and hour law, production costs, etc.
e) History of printing.
Discussed in question under No. 1.
f) Actual related subjects.
These should be taught by the shop teacher in the shop. These actual related subjects can be and should be taught at least in theory and in a practical nature whenever time and equipment will permit.

4. What courses should be added to the above list?

1) Major subjects:
Layout and design
Salesmanship
Estimating
2) Minor courses:
Ink manufacturing
Linoleum block cutting
Wood cutting
Soft zinc cutting
Bookbinding
Block printing

5. Are related subjects really "related"? If not, what can be done to remedy the situation?

As conditions arise, subjects are related and correlated. If the size of the class and the size of the school warrants, it is better to have the related work taught outside of the shop by a trained shop teacher.

6. Should statistics putting printing and publishing in their order in the major industries be taught?

This can be included in another course relating to similar subjects.

8. Should the duties of workers be taught in the related-subjects class?

Teach the duties of administration to all students. We would like to teach all members of the class the duties of the men in various positions in printing plants.

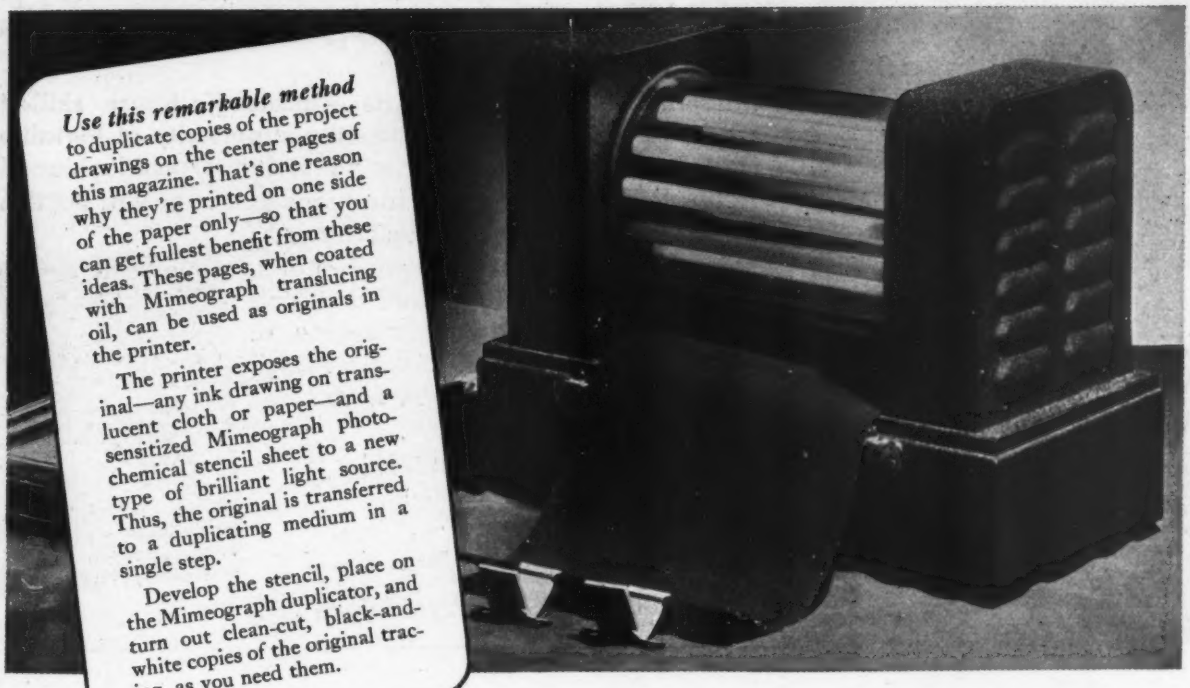
9. Can standards be set up for related subjects?

Yes, standards can definitely be set up.

10. How should students be scheduled for this work? Should the course be concentrated

(Continued on page 14A)

Make Projects Easier with Graphic Instructions



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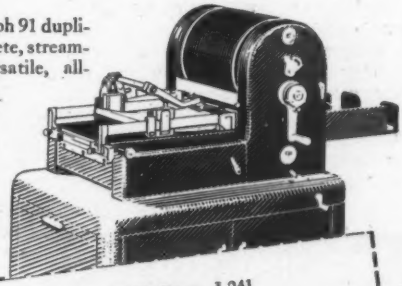

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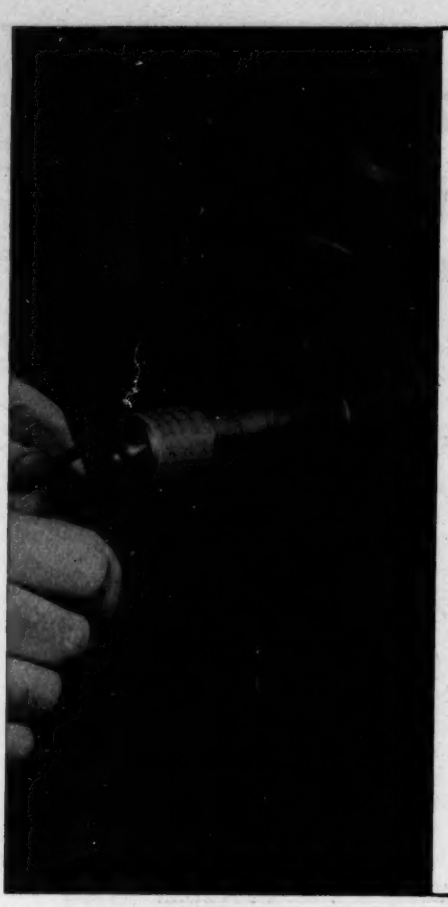

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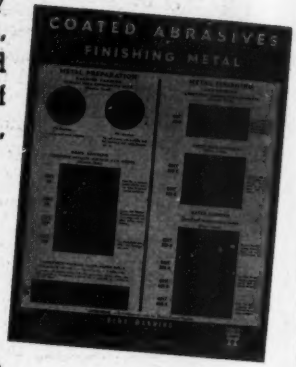

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(Continued from page 82)

in one or two semesters, or spread out over a period of several years?

The individual subjects should be given in concentrated form during the entire course and there should be inserted facilities for complete review before the final conclusion of the course so that subjects that have not been mentioned for several semesters can be reviewed and tied in with the final subject and definitely with the shopwork.

11. What can the teacher-training institutions do to help teachers of printing in this area?

The institutions could help by offering courses in method.

12. Is supervision of printing teachers on a high plane? Is undue difficulty had with scheduling, getting adequate supplies, production, etc.?

Yes, we are on a high plane and we do have difficulty. It is on a much higher plane than it was in 1930 or 1935.

PERSONAL NEWS

Mr. Newton Retires

S. T. Newton, director of technical education for the Province of Manitoba, and supervisor of industrial arts in the Winnipeg public schools has retired, in accordance with the pension regulations, from active service.

Mr. Newton has the unusual distinction of having been engaged for 48 years in educational work without losing a day's work because of illness.

He was director of the Agricultural Extension Service for Manitoba from 1914 to 1924.

Mr. Newton's friends hope that he will have many more years in which he may engage in

S. T. Newton

doing the enjoyable things which his strenuous attention to duty prevented him from even attempting.

♦ Thomas A. Hippaka, professor and director of industrial education of Iowa State College, Ames, was the principal speaker at the celebration of the seventy-fifth anniversary of Jean Sibelius and Finnish Independence Day held in the Lincoln Auditorium, Chicago, on December 7. His topic was, "What America Means to Me." Dr. Hippaka is also the author of "Indomitable Finland."

♦ Dr. Emery Olson, dean, School of Government, University of Southern California, Los Angeles, has been appointed to the U. S. Office of Education staff, according to an announcement made by Paul V. McNutt, Federal Security Administrator. Dr. Olson will serve as a part-time consultant on personnel training problems growing out of national defense activities in industry and government.

Dr. Olson is president of the Civil Service Assembly of the United States and Canada, and president of the Los Angles Civil Service Commission. He is a member of the Executive Council of the American Society for Public Administration, and serves on the Public Service Training Committee of the State Board for Vocational Education in California. Dr. Olson also has helped to establish public service training programs in Los Angeles, Seattle, and in Washington, D. C. During the past 12 years he has directed a professional training program for federal, state, county, and city government employees in southern California in which thousands of employees have been trained each year.

♦ Medard DeRocker, Waterloo, Iowa, has recently been appointed industrial counselor at the Federal Penitentiary, Lewisburg, Pa.

Mr. DeRocker's experience includes industrial arts and vocational education teaching in the public schools of Hawaii, Illinois, and Iowa. He has also had factory experience as craftsman and co-ordinator. His education includes a B.S. degree from Bradley Polytechnic Institute at Peoria, Ill., a master of education from University of Hawaii at Honolulu, T.H., and postgraduate work at Santa Barbara State Teachers College, Calif.; Stout Institute at Menomonie, Wis., and Iowa State College at Ames, Iowa.

♦ George W. Reavis, former state director of vocational education and assistant superintendent of schools of Missouri, died on December 29 at Columbia, Mo.

Mr. Reavis served in the state school system from 1920 until his retirement. He was connected with the Missouri Agricultural Extension Service from 1916 to 1920.

(Continued on page 16A)

Two Valuable Books

That Every Instructor In Industrial Training Should Have

1. New Delta Catalog Just Off The Press

Contains listings and specifications of the complete Delta line of low-cost power tools, including newest tools, accessories and improvements. Explains why this comparatively new type of machine tool is penetrating into every branch of American industry—including defense industries. — A brief study of this new catalog will convince you that when you train your students on Delta machines you are preparing them to use the same tools that industry uses. An analysis of Delta's low prices should prove to you that you can equip or modernize your shop as less than ¼ the cost of old type machines —or that you can train four times as many pupils on the same budget.

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Prepared by vocational instructors from all over the country —the shop layouts and photographs contained in this new book are authentic school shop installations embodying the most ingenious solutions of the problems of space, safety, lighting, convenience and teaching efficiency in both small and large schools. There are actual floor plans and photographs of 30 shops in this attractive 44 page book.

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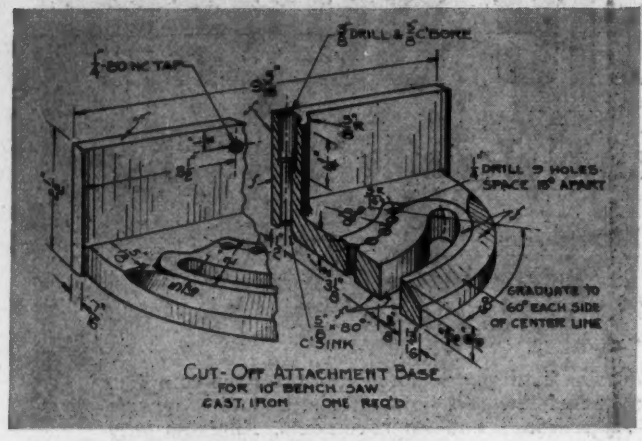
PROBLEM FOR CLASSROOM USE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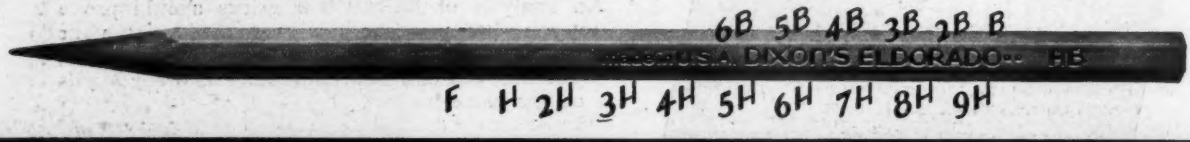


SCHOOL BUREAU, JOSEPH *Dixon* CRUCIBLE COMPANY, JERSEY CITY, N. J.

(Continued from page 14A)

♦ J. H. Bowen, formerly machine-shop instructor at Independence, Kans., has been appointed machine-shop instructor at John Brown University at Siloam Springs, Ark.

♦ S. M. Mutchmor has been appointed supervisor of industrial arts of the Winnipeg public schools, Winnipeg, Canada.

♦ R. K. Johns has been assigned to the position of director of technical education for the Province of Manitoba, Canada.

ASSOCIATION NEWS

COMING CONVENTIONS

Oklahoma Vocational Education Association, February 6–8, at Tulsa, Okla. Pres., L. K. Covelle, A. and M. College, Stillwater, Okla. Secy., H. F. Rusch, Oklahoma City, Okla.

Southern Wisconsin Teachers Association, February 14–15, at Madison, Wis. Pres., R. S. Smith, Supt. of Schools, Jefferson, Wis. Secy., R. L. Liefenberg, Central High School, Madison, Wis.

♦ Representatives of schools in nine towns located throughout the Tulsa, Okla., trade territory attended a dinner meeting of the Tulsa Manual Arts Club, an organization of instructors in Tulsa schools' industrial-education department, on November 20.

Dr. W. T. Bawden, of the industrial-education department of Kansas State Teachers College, Pittsburg, Kans., appeared on the program for the meeting, together with a group of men from the Kansas schools.

Others assisting with the program were L. K. Covelle, state supervisor of trade and industrial education, who spoke on the National Defense Training Program; Dr. H. A. Huntington, head of the department of industrial arts and engineering-shop work, A. and M. College, Stillwater, Okla.; and Dr. DeWitt Hunt, head of the department of industrial arts and engineering-shop work, A. and M. College, Stillwater, Okla.

The theme for the meeting was "What Specific Contributions Are Made by Industrial Education Toward Assisting Youth to Solve Occupational Problems Which Mean Jobs or Job Adjustment?"

There were 94 men in attendance. This was one of the largest meetings of this type ever held by the Tulsa Manual Arts Club.

♦ The Western Illinois Round Table Group has held two meetings this past fall, one in Geneseo, Ill., and the other in Aledo, Ill. Even though a large number of industrial-arts men are teaching extra classes in the National Defense Program, there has been a good attendance at both meetings. The group is looking forward to a very successful year under the leadership of their new president, L. L. Josserand of East Moline.

The next meeting will be held in Galesburg sometime in March.—*C. R. Wright, Secy.-Treas.*

♦ The industrial-arts section of the Texas State Teachers Association, held its meeting at Fort Worth on November 22.

The chairman of the program was R. W. Adams of North Texas State Teachers College, and the general theme was, "Industrial Arts and a Program of Education for the Common Defense."

The speakers on the program were: John E. Cherry, Paschal High School, Fort Worth; J. D. Cody, McLean Junior High School, Fort Worth; and Chris H. Groneman, A. and M. College of Texas, College Station.

The vocational section met on November 23. John E. Brown, of John Brown University, Siloam Springs, Ark., addressed the group on the subject of "Threefold Education."

♦ The Wisconsin Association for Vocational and Adult Education will hold its annual convention at the Schroeder Hotel, Milwaukee, Wis., on May 1, 2, and 3. The local arrangements are in charge of William F. Rasche, director of the Milwaukee Vocational School. President John A. Kubiak of Wausau is preparing the program. An educational and commercial exhibit will be held.

♦ The industrial-arts instructors of Worcester County, Md., held their third meeting on November 30 at Ocean City. The members, John T. Bruehl, Jr., Berlin; Gerhardt Neubauer, Pocomoke City; Robert J. Johnson, Ocean City; and Vernon Patz, Snow Hill, worked on a plan to set up a course of study for general drawing for the county. Each member is to write his version of: an introduction, objectives, operations, problems and plates, related subject matter, and references. At the January meeting these subjects will be discussed and arranged into a course that can be used by all of the schools in the county.—*John T. Bruehl, Jr.*

♦ The regular monthly meeting of the New York School Crafts Club was held in the Hotel Imperial, New York City, November 16, 1940.

Mr. Hemion of the Paterson (New Jersey) High Schools gave an outline and talk on industries, discussing the constant industrial changes and their effect upon our educational system.

George Vosberg of the Tilden High School (Brooklyn) gave an interesting talk and demonstration on art-metal and jewelry work. A fine exhibit of art-metal craft was displayed.

The next meeting will be held in the Hotel Imperial on January 18, 1941. The feature of the program will be "End of the Term Jobs Which Can Be Completed in Two to Four Periods" by Charles G. Fisher, Junior High School 210, Brooklyn. The Casein Company of America will present a speaker whose topic will be "Glue and Gluing."—*Allan S. MacGregor.*

(Continued on page 19A)

(Continued from page 16A)

THE THIRTY-FOURTH ANNUAL A.V.A. CONVENTION

It is the afternoon of Wednesday, December 18, 1940. A huge crowd has filled the Terrace Ballroom of the Fairmont Hotel, San Francisco, Calif., since 2 o'clock. It has sat through the meeting of the house of delegates while this body conducted the annual meeting of the American Vocational Association. It has listened with close attention to the reports of the secretary, treasurer, resolution committee, and the nomination committee. It has heard with satisfaction that L. R. Humpherys, department of agricultural education, Utah State College, Logan, Utah, has been elected president of the A.V.A. for the coming year. Also that the genial Charles W. Sylvester, director of vocational education, Baltimore, Md., will be the Argus-eyed guardian of the treasury for another year.

Besides these two, John J. Seidel, state director of vocational education, Baltimore, Md., was elected as vice-president in charge of industrial education and Claude Andrews of Tallahassee, Fla., as vice-president in charge of vocational rehabilitation, both for a term of three years.

It has also been informed that Boston, Mass., the home of ex-president, Robert O. Small, has been chosen as the host for the 1941 convention, and that the dates on which the convention will be held, will be selected and announced later.

Then this great gathering sat with expectancy through the Ship's program, as it was put on by the efficient L. P. Arduser and John Backus.

The Ship specially honored Dr. Edwin A. Lee, dean, School of Education, University of California, Los Angeles, Calif., and L. H. Dennis, the hard-working, efficient executive secretary of the A.V.A., and it has made happy an appreciable number of the audience by drawing lots to discover who were to be the recipients of the many donations made by the commercial exhibitors.

And now the program has come to an end, and the large audience is leaving the hall, realizing that the convention meetings which they have so faithfully attended have also terminated, and that the 1940 A.V.A. convention had passed into history.

The convention theme, "Vocational Education for Preparedness, Protection, and Peace" was made the central idea of practically all of the discussions held. The state directors of vocational education held their annual meeting on Friday and Saturday, December 13 and 14, and the national council of city administrators of vocational education and industrial arts on Sunday, December 15.

The thirty-fourth annual A.V.A. convention proper started on Monday, December 16.

The industrial-arts section had arranged for five meetings. The first of these, at which the co-ordinating relationships of industrial arts were discussed, was held Monday morning at 9:30 o'clock.

William T. Bawden, professor of industrial education, Kansas State Teachers College, Pittsburg, Kans., chose for his subject, "A Living and Learning Philosophy." In his address he emphasized that education is a continuous thing. That it is going on whether the student is at home or at school. That this education must form a unity which helps the complete growth of the individual, and that in contemplating such a philosophy, industrial arts cannot be left out.

The next speaker, Heber A. Sotzin, director, division of industrial arts, San Jose State College, San Jose, Calif., spoke on the subject, "A Leavener of School Curricula," and emphasized the necessity of better prepared teachers who have a thorough grasp of their responsibility and of what they were to do for their students.

F. Theodore Struck, head, department of industrial education, Pennsylvania State College, State College, Pa., spoke on "A Service to Modern Industry." He pointed out that the industrial-arts teacher was faced with the important task of cooperating with others in safeguarding, improving, and perpetuating the free American ways of life.

These industrial-arts meetings were uniformly well attended, the groups varying between 200 and 250.

The second meeting of this section was held at 2 p.m. The theme was, *The Industrial Arts Teacher on Today's Frontier*, and Otto A. Hankammer, professor, department of industrial and vocational education, Kansas State Teachers College, Pittsburg, Kans., presided. The subjects discussed were: "Selection of Candidates for Teaching," "Preparation for Teaching," and "Improvement of Instruction," and the speakers were: Lynn C. Monroe, division of industrial education Santa Barbara State College, Santa Barbara, Calif.; William T. Bawden; and Omar B. Badger, director of vocational education, Portland, Oreg.

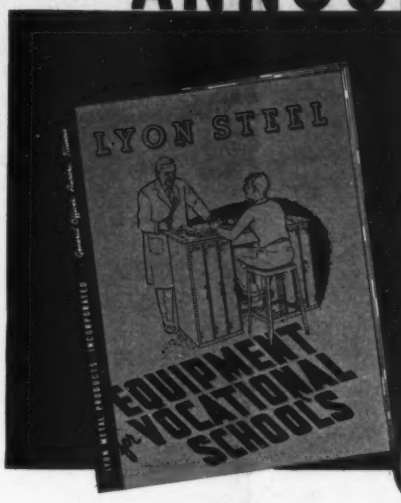
The meeting on Tuesday morning had for its theme *Industrial Arts in the Elementary School*. Louis V. Newkirk, director, bureau of industrial-arts education, Public Schools, Chicago, Ill., presided. Heber A. Sotzin discussed the subject from the viewpoint of the Pacific States; Kenneth F. Perry, professor of industrial arts, Colorado State College of Education, Greeley, Colo., as it applies to the Mountain States; George B. Cox, professor of industrial arts and director of engineering shops, Oregon State College, Corvallis, Oreg., as it affects the secondary school; and John J. Metz, editor, INDUSTRIAL ARTS AND VOCATIONAL EDUCATION, as it is viewed by an editor and publisher.

At the meeting on Wednesday morning, Kenneth F. Perry presided. The discussions were centered around *The Expanding Scope of Industrial Arts*. Emanuel E. Ericson, director, industrial education department, Santa Barbara State College, Santa Barbara, Calif., outlined "The Purpose and Nature of Expansion"; and R. B. McHenry, director, department of industrial and adult education, Public Schools, Tulsa, Okla., "The Problems of the Arts and Crafts."

Homer J. Smith, A.V.A. vice-president for industrial arts, and Arthur B. Mays, industrial-

(Continued on page 20A)

ANNOUNCING A



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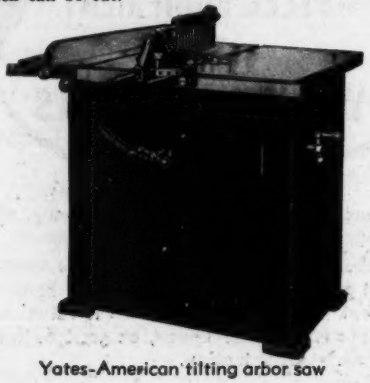
SHOP EQUIPMENT NEWS
New Products—Publications

NEW TILTING ARBOR SAW

A new 10-in. tilting arbor circular saw which combines high efficiency with low cost has just been announced by the Yates-American Machine Co., Beloit, Wis. This saw was developed especially for use in production plants, school shops, pattern shops, furniture factories, and for contractors and other types of operations where full capacity is essential.

This unit, known as the W-55 has a standard one-piece table 32 by 36 in. which provides for a cutoff capacity of 17 in. ahead of the saw on the table itself, and 25 in. when the front table extensions are used. The saw will rip to the center of 38-in. stock without extensions, and to the center of 50-in. stock with side extensions which are offered as extra equipment. Stock 3¼ in. thick can be cut.



Yates-American tilting arbor saw

While the W-55 is in the popular price range, it has several engineering features usually found only on heavier equipment. Notable among these is the hoisting and tilting mechanism. The hoist and tilt screws have a heavy Acme thread and no gears are used. The saw arbor runs in sealed ball bearings which are lubricated for life.

The "pivot-action" for raising and lowering the saw allows quick, easy adjustment for depth of cut since the motor remains stationary while the arbor mechanism rotates around it. This makes it unnecessary to hoist the weight of the motor along with the saw.

The table is made of heat-treated cast iron, well ribbed and highly finished by grinding. It is provided with two miter-gauge slots, one on either side of the saw. The double-faced rip fence slides on a bar mounted clear of the table, where dust and chips cannot accumulate or restrict its movement. A steel throat plate is provided.

The ¾-in. arbor is driven by three V belts from the motor. A.c. motors of ½, ¾, and 1 h.p., single or 3 phase, and a 1½ h.p., 3 phase, a.c. motor can be used. Arbor speed is 4000 r.p.m. All motors are totally enclosed and fan cooled. Belt tension is adjustable. Arbor and motor tilt as a unit.

TWO NEW DRAFTING TABLES

The Frederick Post Co., P.O. Box 803, Chicago, Ill., announces the appearance of two new drafting tables.

The Primo Metapost table is quickly and smoothly adjusted by turning a freely operating hand wheel that will raise the working surface from 35½ in. to 43 in. The top of the table may then be tilted from front to back at an angle of sixty degrees by the manual adjustment of two hand clamps.

The Metapost has the same adjustment features as the Primo Metapost with the one exception of the hand wheel control which raises the top. To raise the top of this table requires loosening two thumb screws on the uprights supporting the table top, permitting the working surface to be manually raised from 35½ in. to 43 in. The top of the table may then be tilted from front to back in the same manner as the Primo Metapost. These tables have a neat, streamlined appearance which will modernize any drafting room.

Primo Metapost drafting table

A reference shelf may be attached to either the Primo Metapost or the Metapost. These handy shelves offer ample space for drawings, materials, and the like.

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For further information, contact the nearest Post dealer or write to the address given in the foregoing.

PRECISION SERIES "J"

The Precision Apparatus Co., announces a new accurate and reliable, popularly priced multi-range a.c. ammeter; designed for many fields of application, such as radio service, electrical-appliance repairs, refrigeration, air conditioning, motor repair, machine shop, transmitting, and so on. It can be used on all line frequencies from 25 to 60 cycles; 300 milliamperes full scale to 60 amperes; 8 a.c. current ranges; special *red* correction scale for direct reading on 25-cycle service; 4½ in. square-type meter, accurately balanced and pivoted a.c. movement with specially constructed damping chamber. Meter accuracy is

Precision Series "J" ammeter

2 per cent. When used with either the Precision Series 844, 854, or 862 multi-range testers, the "J" provides a complete all-purpose a.c.-d.c. industrial-type circuit analyzer. Available in three models. Literature can be obtained from the manufacturer, Precision Apparatus Co., 647 Kent Ave., Brooklyn, N. Y.

HOLD-HEET GLUEPOT

Russell Electric Co., 340 West Huron St., Chicago, announces a newly improved Hold-Heet Electric Gluepot with automatic thermostat control.

This gluepot which keeps glue at correct temperature always is said to embody several features which contribute to more satisfactory gluing operations and to long life of the pot. The Hold-Heet has no water jacket to boil dry with danger of damaging the pot and the glue. Even temperature is maintained by thermostatic control. The heating element has been especially designed to insure long life and even distribution of the heat. The pot is said to be so thoroughly insulated at the vital places that heat losses are reduced to a minimum. The rugged steel body of the pot is said to make it especially suitable for the strenuous demands of school shopwork.

A new bulletin on this pot has been issued by the Russell Electric Co., and may be obtained directly from the manufacturer.

PRICE REDUCTION

The A. B. Dick Co., 720 West Jackson Blvd., Chicago, Ill., announces a price reduction of the more widely used Mimeograph brand stencil sheets, effective January 1, 1941.

In spite of this reduction, the previous high quality of these stencils will be maintained. This has been made possible by the constant research carried on by this firm which has resulted in techniques permitting lower manufacturing costs.

DOUGLAS FIR PLYWOOD PAMPHLET

Douglas Fir Plywood Association, Tacoma, Wash., has just issued a 16-page pamphlet describing and illustrating the usefulness and versatility of their product under all kinds of conditions and for many uses.

This material contains a selection chart, structural data of various kinds, explanation of acoustical and insulation properties, and descriptive material on exterior and interior uses, and methods of finishing.

The use of plywood to form panels for concrete work also is described.

"HOW TO CHOOSE A SLIDE RULE"

"How to Choose a Slide Rule," by Don Herold, contains 24 pages and 26 illustrations. This humorous publication explains for the first time the difference between the various types of slide rules available, in straightforward, salty language. Although written primarily for students in engineering colleges, this booklet contains slide-rule information of interest to the entire engineering profession. Free upon request. Write to Keuffel & Esser Co., Hoboken, N. J.

THE LINCOLN WELDIRECTORY

The Lincoln Electric Co., Cleveland, Ohio, has just issued "The Lincoln Weldirectory," a 56-page pamphlet which contains much of interest to teachers of arc welding.

Among other items of information are a check chart for electrode values, procedure pointers on shielded arc welding, guide for the selection of electrodes, and procedures for welds in various positions, and on various types of materials. Directions are also given for building up worn steel parts to resist abrasion, and for building up super-speed metal-worn cutting edges of tools and dies.

Welding supplies, equipment, protective clothing, head shields, and the like, also are described.

ASSOCIATION NEWS

(Continued from page 19A)

arts representative on the Editorial Board and on the Central Research Committee of the A.V.A., gave their reports of progress.

The special A.V.A. Committee now engaged in the revision of the bulletin entitled, "Standards of Attainment in Industrial Arts Teaching," consists of Charles F. Bauder, William T. Bawden, Clyde A. Bowman, Emanuel E. Ericson, John F. Friese, Verne C. Fryklund, Arthur B. Mays, Maris M. Proffitt, William E. Roberts, Robert W. Selvidge, Homer J. Smith, and George F. Weber.

At the Industrial-Arts Luncheon held at noon on Wednesday, Charles E. Barker, director of industrial arts and vocational education, Public Schools, San Francisco, Calif., was the chairman, and Roy A. Hinderman, director of research and vocational education, Public Schools, Denver,

(Continued on page 23A)

STARRETT EDUCATIONAL SETS: Fourteen blue printed pages, each showing a different tool and illustrating its various uses. 8" x 10½" size, punched to fit a standard student's notebook, furnished at 10 cents per set. Also available in large size for instructor's use.

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(Continued from page 20A)

Colo., was the toastmaster. Lindley H. Dennis, Verne C. Fryklund, Arthur B. Mays, F. Theodore Struck, and John J. Metz gave brief addresses.

The National Association of Industrial Teacher Trainers met Sunday, December 15, at 9:30 a.m. George Cox presided. At this meeting, F. Theodore Struck spoke on, "Industrial Teacher Education at the Graduate Level"; Samuel Fick, assistant supervisor, Trade and Industrial Teacher Training, University of California, Los Angeles, on "Evaluation of Vocational Training and Placements from Certain Los Angeles High

F. Theodore Struck, newly elected president of the National Association of Industrial Teacher Trainers

School Vocational Classes"; and Verne C. Fryklund on "Industrial Arts Teacher Education in the United States."

At the business meeting, President Verne C. Fryklund presided. The following officers were elected for the coming year: President, Dr. F. Theodore Struck; Vice-Presidents, Dr. Lawrence F. Ashley, director, department of vocational education, Board of Education, Yonkers, N. Y.; Thomas A. Diamond, professor, University of Michigan, Ann Arbor; and George B. Cox. Trustee, Clyde A. Bowman, dean, department of industrial education, Stout Institute, Menomonie, Wis. Secretary-Treasurer, E. L. Williams, Texas A. and M. College, College Station, Tex. Committee on Research, Dr. Anthony M. Goldberger, chairman, director, vocational teacher education, University of Pittsburgh, Pittsburgh, Pa.; Verne C. Fryklund; and David F. Jackey, supervisor, trade and industrial teacher training, University of California, Los Angeles.

(To be continued)

NEW PUBLICATIONS

Training Procedure

By Frank Cushman. Cloth, 230 pages, 5¼ by 7½. Price, $2. Published by John Wiley and Sons, Inc., New York, N. Y.

A compact book specially designed to present an orderly and practical procedure for those who have charge of the in-service training of employed persons in industry, business, and public service organizations.

The book is divided into 7 chapters, which group the contents under the following headings: the problem of training employed personnel, identification of need and preliminary planning, the organization of training, the operating or putting-over stage, checking the outcomes of the training program, the application or training stage, and the holding-on or maintenance stage.

Appendices containing an outline of an instructor training course, outline of conference leaders training course, and a number of selected reading references complete the book.

Arithmetic for Printers

By J. Woodard Auble. Cloth, 180 pages, 5¾ by 8⅝, illustrated. Price, $1.72. Published by The Manual Arts Press, Peoria, Ill.

This book is designed for the student of printing. Practice is first given the student in the fundamental arithmetical operations in fractions, decimals, and percentage. Then the point system is explained and its application is shown in making measurements, spacing, estimating jobs, and copyfitting.

Problems involving paper and inks also are included.

Practical Mathematics

By Hobbs, McKinney, Dalzell. Cloth, 600 pages, 5¾ by 8½. Price, $2.40. Published by the American Technical Society, Chicago, Ill.

This book, embracing the principles of arithmetic, equations, formulas, mensuration, graphs, and logarithms, was especially written for the beginner and those who need to refresh their memories on the mathematics needed by the worker.

Examination questions accompany each section of the book.

Technical Drawing

By Giesecke, Mitchell, and Spencer. Cloth, 687 pages, 6¼ by 9¼, illustrated. Price, $3. Published by the Macmillan Co., New York City.

This is a revised and enlarged edition of a comprehensive book on technical drawing. The material is presented in 29 chapters under the following headings: instruments and materials, instrumental drawing, geometry of technical drawing, lettering, projections, multi-view projection, auxiliary views, revolutions, sectional views, axonometric projection, oblique projection, perspective, intersections and developments, dimensioning, fasteners, shop processes, working drawings, gearing and cams, pipes, fittings, and valves, welding representation, technical sketching, shading, patent office drawing, graphs, architectural drawing, structural drawing, topographic drawing, and reproduction of drawings.

(Continued on page 25A)

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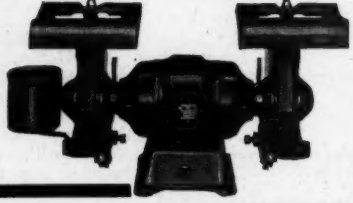

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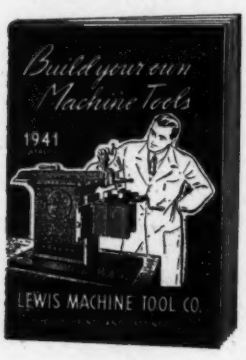

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(Continued from page 23A)

The book also contains an appendix containing many tables useful to the draftsman.

Practical Electricity

By Terrell Croft, revision by Geo. H. Hall. Cloth, 701 pages, 5¾ by 8¼, illustrated. Price, $3. Published by McGraw-Hill Book Co., New York City.

This is the fourth edition of this very complete book on electricity for the practical man. It has been brought up to date and contains, like its predecessors, descriptions that are couched in simple language, interesting illustrations to clarify the written matter, numerous practical applications, problems, and completely worked mathematical examples.

How to Design and Install Plumbing

By A. J. Matthias, Jr. Cloth, 388 pages, 5¾ by 8½, illustrated. Price, $3. Published by the American Technical Society, Chicago, Ill.

This book was written for the beginning tradesman and as a reference book for the practical mechanic.

The subject material is divided into 27 chapters in which the instructional material is dealt with under the following headings: municipal sewage disposal, private sewage disposal, materials used for sewer pipe and fittings, joints in clay and iron sewer-waste and vent, house sewer, house drain, house drain appliances, storm drainage, soil pipe, waste pipe, traps used on plumbing systems, ventilation, soil, waste, and vent pipe principles, inspection and test, water supply, materials used for water distribution, joints on water supply systems, house service, cold water distribution system, pumps and lifts, cold water distribution systems in tall buildings, domestic hot water supply, hot-water distribution systems, private water correction, cross-connections, fire line installation, plumbing fixtures, water closets, lavatory, bathtubs, shower bath, sinks, urinals, laundry tubs, drinking fountain, questions pertaining to plumbing, and index.

The Integrated School Art Program

By Leon L. Winslow. Cloth, 391 pages, 7⅜ by 9¼, illustrated. Price, $3.50. Published by McGraw-Hill Book Co., New York, N. Y.

A book based on the new idea of building up the individual subject so as to revolve about experiences that mean something to the child in its total school and individual life. It is written so as to embody both the knowing and the doing aspects of art.

The book consists of ten chapters, the title of which are as follows: Art in a Changing World, Art Education to Meet Modern Needs, Activity Experience in Art Education, The Organization of Instructional Material, Art in the Elementary Schools, The Junior-High-School Program, Art Courses in the Senior High Schools, The School Museum, The Discovery and Evaluation of Art Abilities, and Books on the Arts.

Appendix A is devoted to notes on art appreciation describing the purposes served by art, art forms and quality, and art as it existed from prehistoric days up to the present.

In Appendix B are listed the verbs and phrases used in preparing written lesson plans.

Artyping

By Julius Nelson. Paper, 91 pages. The Gregg Publishing Company, New York, N. Y.

A booklet giving procedures for reproducing on the typewriter drawings, landscapes, and portraits, and the making of simple and advanced designs, cutout designs, letters of all sizes, and artyping for special occasions.

Skiing

By Walter Prager. 92 pages, 6⅛ by 9¼. Price, $1. Published by A. S. Barnes and Co., Inc., 67 West 44th St., New York City.

This book contains practical suggestions for the beginner and advanced techniques for the experienced skier.

In it are described the equipment needed, how to practice the first steps on the level, the climbing steps, how to get up from a fall, downhill skiing and touring, making turns, cross-country skiing, racing, jumping, and the training any and all of these phases of this form of athletics requires.

MISCELLANEOUS BOOKS

Among the books received which may be of interest to school-shop instructors are the following:

Bibliography of Books and Pamphlets for Trade Training

Prepared by Thomas Hankins. Paper, 43 pages, 8½ by 11. Issued by the Department of Industrial Education, University of Kentucky, Lexington, Ky.

Findlay Vocational Trade and Industrial Program

Prepared by the Findlay Vocational High School Faculty, Findlay, Ohio. Paper, 244 pages, 8½ by 11. Developed by the faculty of the Findlay Vocational High School, in cooperation with the vocational department of the University of Toledo and the State Board for Vocational Education, Division of Trades and Industries.

Eighty New Books on Occupations

By Walter J. Greenleaf. Paper, 31 pages, 5¼ by 8. Issued by the Federal Security Agency, U. S. Office of Education, Washington, D. C.

Careers — Industrial Designing as a Career

By the Editorial Board of John A. Lapp, Paul H. Douglas, Robert L. Cooley, and Charles A. Prosser. Paper, 8½ by 11. Price, $1. Published by The Institute for Research, Chicago, Ill.

The Citrus Industry and Occupations in Florida

By Joe A. Youngblood. Paper, 182 pages, 8½ by 10¾, illustrated. Issued by the National Youth Administration for Florida. The study was directed by Dr. A. R. Mead, director of Research, School of Education, University of Florida. Gainesville, Fla.

1000 and One — The Blue Book of Non-Theatrical Films

Paper, 132 pages, 6 by 9. Price, 75 cents. Issued by the Educational Screen, Chicago, Ill.

The Chemist at Work

By Roy I. Grady and John W. Chittum. Cloth, 422 pages, 5¼ by 7¾, illustrated. Price, $3.

(Continued on page 27A)

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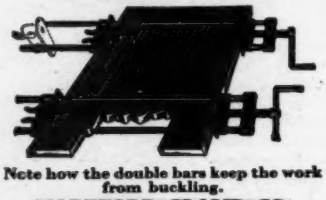

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(Continued from page 25A)

Published by Journal of Chemical Education, Easton, Pa.

Student's Exercise Book in Junior Business Training

By Raymond C. Goodfellow, assisted by M. Herbert Freeman. Paper, 155 pages, 8⅛ by 10¾. Price, 60 cents. Published by Macmillan Co., New York City.

A Report on the Symposia Sessions (19th Annual Conference on Printing Education, The National Graphic Arts Education Association.)

Paper, 47 pages, 6 by 9. Published by the National Graphic Arts Education Association, 719 Fifteenth St., N.W., Washington, D. C.

Delta Shop Booklet Series

Issued by the Delta Manufacturing Co., Industrial Division, E141, 600 E. Vienna Ave., Milwaukee, Wis.

These booklets are paper covered, of uniform size (6 by 9 in.), and all of them contain a capacity amount of well-illustrated and clearly described material which will be found applicable in the home workshop as well as the school shop.

All of the booklets, with the exception of the one entitled, "Practical Finishing Methods," are 25 cents per copy. The one on finishing is priced at 50 cents.

A brief description of the books in the series, follows:

"Getting the Most out of Your Circular Saw and Jointer." This book is divided into seven chapters, describing the saw as a piece of equipment, the blades and cutters used, the operations possible with this tool, molding and dado heads, and the use of abrasive wheels.

Three chapters are devoted to the jointer, its adjustments, operations, and a number of jointer kinks. There also is an appendix containing useful tables and hints.

"Getting the Most out of Your Lathe." In the thirteen chapters into which this book is divided, wood turning, metal turning, and metal spinning is thoroughly described.

The book also contains an appendix containing much useful information.

"Getting the Most out of Your Shaper." There are eleven chapters and an appendix. These describe adjustments; cutters and collars; operations; shaping with guides, collars, patterns, and forms; jigs and fixtures; and the grinding of cutters.

"Getting the Most out of Your Band Saw and Scroll Saw." This is the fifth edition of this booklet. The four chapters on the band saw describe the saw as a piece of equipment, its blades, how it is operated, and its use for metal cutting.

Three chapters are devoted to a description of the scroll saw, its operation, and how it may be used for sanding and filing.

"Getting the Most out of Your Drill Press." This booklet, which is in its fifth edition, describes the laying out of the work; the operations of drilling in wood and metal; routing, shaping, and mortising on the drill press; and miscellaneous other drill-press operations.

"Getting the Most out of Your Abrasive Tools." There are 12 chapters in which abrasive tools, abrasive belt sanders, disk sanders, drum sanders, tool grinding, and cutting-off wheels are thoroughly described.

"Practical Finishing Methods." This is a booklet which treats in a comprehensive way of brush and spray finishing, stains and staining, fillers and sealers, varnishes and varnishing, lacquer and lacquering, waxes and waxing, rubbing and polishing, and bleaching and shading. The book also contains many useful hints on the preparation and applying of finishes, formulas for mixing various kinds of finishes, hints on decoration, and a full explanation on the silk-screen process.

NEWS NOTES

♦ The Brookline, Mass., school committee recently established a vocational machine-shop course for students in the high school. The course is extensive and will enable the student, successfully completing it, to obtain a position immediately, and at the same time will aid the National Defense Program.

♦ A plan to help high school principals in their efforts to aid their students to become better adjusted occupationally after they leave school is now being introduced under the sponsorship of the National Association of Secondary-School Principals. Former students, both graduates and dropouts are studied in order to obtain information which is basic to a continuous appraisal of that aspect of the school program aimed at occupational adjustment.

Any school interested in the follow-up plan may obtain further information by writing to Edward Landy, director, at the national headquarters, 425 W. 123 St., New York City.

♦ Wayne University is establishing a student branch of the Institute of Aeronautical Sciences, professional organization of 3000 aeronautical scientists, engineers, and pilots, Dr. W. Frederick Gerhardt, professor of aeronautical engineering, announces.

Membership at Wayne will include all 75 of the aeronautical students currently enrolled in the College of Engineering, among them one coed.

♦ The program of the Department of Publishing and Printing and other courses at the Rochester Athenaeum and Mechanics Institute will be expanded and strengthened as the result of an endowment campaign which has netted approximately $750,000 for the Institute. George H. Clark, Rochester industrialist, who offered to contribute two thirds of a dollar for every dollar pledged by the public before December 31, 1940, has given approximately $300,000. Clark offered up to $400,000 if $600,000 was raised from other sources.

The Department of Publishing and Printing was started in 1937 and is one of ten departments of the oldest Rochester educational institution. A two-year post high school printing course is offered on the professional level.

♦ To help solve the problem of national defense, a new mechanics' training course, consisting of 35 slide films dealing with the mechanical principles and operation of automobile assembly units, has been issued. It is now being used in a number of the large motor transport schools of the quartermaster corps of the United States Army as well as in vocational classes in public schools. It was produced by the Jam Handy Organization, 7821 E. Grand Blvd., Detroit, Mich., with the unofficial cooperation of the instructing staff at the Camp Holabird, (Maryland) Quartermaster Depot and the help of prominent automotive engineers.

The mechanics' training-course slide films are designed to produce in record time the vast numbers of mechanics needed for the growing motorized and mechanized army units, as well as for our expanding industry behind the lines.

♦ Byron G. Culver, supervisor of the Department of Publishing and Printing, Rochester Athenaeum and Mechanics Institute, Rochester, N. Y., recently announced that a 100 per cent placement record has again been made for the 1940 graduates. This repeats the record of 1939 when the first class was graduated from the department at Rochester.

He states that requests from employers for graduates exceeded the supply in some cases as each is recommended only for positions in which his personality and training give good assurance of success. Several graduates at once moved into executive positions requiring considerable responsibility.

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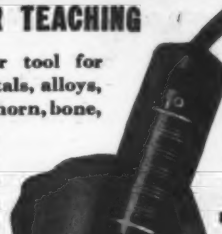

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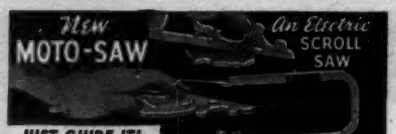

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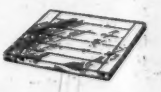

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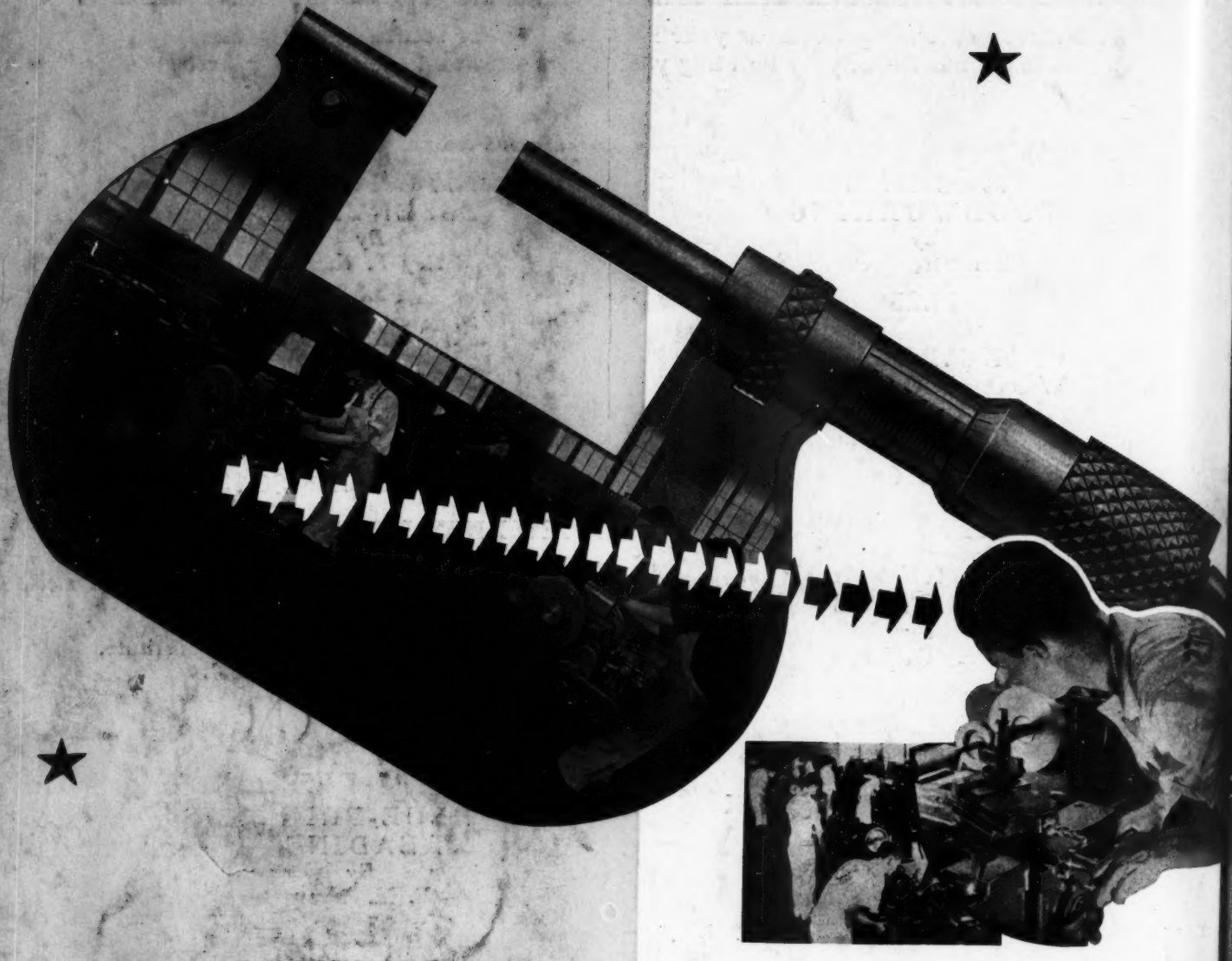

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